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INFORMATION REPORT INFORMATION REPORT

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50X1-HUM

COUNTRY Yugoslavia

REPORT

SUBJECT Technical Manual: 76-mm Mountain
Howitzer, Manufactured in Yugoslavia

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an undated English-language document on the 76-mm mountain gun manufactured in Yugoslavia.¹ It includes the following technical data: 50X1-HUM

- a. Description, including types of ammunition required. (180 pages)
- b. Repair Manual, Model Bl. (237 pages)
- c. Books III and IV: 76-mm gun M48 Bl, BlA1, BlA2, BlA3, BlA4 - figures. (92 pages)
- d. Firing tables for M48Bl, BlA1 - A4. (147 pages)
- e. Book III: Accessories (range quadrant DB-1; panoramic telescope M57; gunner's quadrant M50; lighting accessories P0-2) (52 pages) 50X1-HUM

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INFORMATION REPORT INFORMATION REPORT

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RESTRICTED

FIRING TABLES

MOUNTAIN GUN

76 mm M 48 B-1, B1A1-4

FIRING

HE, SHELL M.55

HE, SHELL OF-350

and

HE, AT, SHELL

RESTRICTED

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PART I

GENERAL PROVISIONS

1. These Firing Tables are designed for firing from **76 mm Mountain Gun M48 B1*)** with:

- **high explosive shell M55** semi-fixed round BOΦ-357M with fuze UTU M51 A5 (table II)
- **high explosive shell OΦ-350** semi-fixed round BOΦ-357M with fuze KTM-1 (table II)** and
- **high explosive anti-tank shell BII-350/2** (76 mm round YBII-357M) with fuze K-451 (table IIa).

2. It is not advisable to fire with the **4. increment charge** of the BOΦ-357M round **below the elevation of 10°**, since when firing below this elevation major bouncing of the weapon occur.

3. These firing tables are computed for the following normal requirements:

*) All provisions and data in these Firing Tables are computed for weapons carrying the markings B1A1, B1A2, B1A3 or B1A4.

**) When firing with this shell with the second, third and fourth increment charge without the cap on the fuze KTM-1, the range correction specified in the column 22, shall be taken. And when firing with the third and fourth increment charge with the cap on the fuze KTM-1 then the range correction specified in column 22a shall be taken.

a) Ballistic:

- Reference weapon
- Muzzle velocity according to Firing Tables
- Shell, normal in shape, weight and center of gravity
- Powder temperature + 15°C.

b) Meteorological:

- Barometric pressure 750 mm
- Air temperature + 15°C
- Air moisture 50%
- Still atmosphere — no wind.

c) Topographical:

- Gun emplaced on a horizontal level
- Target in level with the gun.
- 4. These Firing Tables are computed for mils 1/6400 of the circumference of the circle in metric system.
- 5. The data contained in Firing Tables are obtained by ballistic firing on the proving ground.
- 6. The 76 mm Mountain Gun M48 B-1 is designed for **low-angle firing**, that is, with the elevation up to 45° (800/000).¹⁾ However, in case of necessity, **high-angle fire** can be also conducted with this weapon (from 45° to 65°). In that instance, the following steps should be taken:
 - a) Remove the carriage rear trails, so that the weapon rests on the short carriage trails.
 - b) Make seats for the short carriage trails by digging holes (about 40 cm deep) in the ground, as well a rectangle trench beneath the breechring for the recoil space (about 50 cm deep) providing sufficient length so that the barrel can be loaded at elevations higher than 45°.²⁾

¹⁾ When the gun is emplaced on level ground and with normal carriage trails, setting of elevations up to 45° is possible. When the gun is on level ground but with shortened carriage trails, setting of elevations up to 50° is possible.

²⁾ When the gun is in position for high-angle fire (with short carriage trails dug in) it is not possible to set elevations below 200/000. Consequently, firing on tanks cannot be performed in that position or on targets requiring elevations lower than 200/000, and therefore the gun shall be towed to a level base beforehand.

c) Pull the shield link into the rear position and lock the same.

d) Select an aiming point behind the weapon, if possible, in the direction extending rearward of the firing direction and in the horizon of the weapon or below the same. If conditions for selection of such a point do not exist, the picket shall be used.³⁾

e) The emplacement of the weapon (the part where the wheels are positioned) shall be leveled as much as possible.

f) The elevation of the barrel shall be set by means of the gunner's quadrant or range quadrant which has graduations from 0 to 1200 mils.

g) Verification of sighting shall be performed in the following manner:

— At the elevation of 45° perform sighting on the aiming point;

— After setting the commanded elevation (over 45°) center the cross level (for elimination of the cant of the cradle trunnions) and sight on the aiming point by means of the elevation drum and barrel traversing mechanism handwheel.⁴⁾

³⁾ If the aiming point is selected in front of the weapon, the shields shall be removed in order to perform sighting—which is not preferable.

⁴⁾ When conducting high-angle fire, the range quadrant level cannot be centered after setting of the elevation, that is, the sighting device cannot be brought into the vertical position. Therefore the first sighting shall be performed at the elevation of 45° (where the sighting device is in the vertical position), and after setting the commanded elevation center only the cross level and perform again the sighting on the aiming point (or picket) by means of the elevation drum and barrel traversing mechanism handwheel.

PART II

WEAPON

1. Numerical data

a) Design:

— Caliber of the barrel	76,2 mm
— Length of the barrel (without breechring)	1178 mm
— Length of the barrel in calibers	15,46 cal.
— Number of grooves	24
— Twist of rifling	3°17'10" - 7°10'
— Type of rifling	right
— Width of lands	3 mm
— Width of grooves	7 mm
— Depth of grooves	0,762 mm
— Volume of the powder chamber	1,490 dm ³
— Length of powder chamber	306 mm
— Length of the rifled portion	779 mm
— Traverse	50°
— Elevation with normal carriage trails	—15 to +45°
— With shortened carriage trails up to	+ 50°
— With shortened carriage trails dug-in from	+ 12° to 65°
— One turn of the traversing mechanism handwheel	0-26 mils

— One turn of the elevating mechanism handwheel	0-08 mils
— Amount of fluid in the recoil brake	1,200 dm ³
— Amount of fluid in the recuperator	1,240 dm ³
— Air pressure in the recuperator	62 ± 1 Atm.
— Maximum recoil length for the fourth charge:	
At elevation of 0°	330 mm
At elevation of 40°	530 mm
— Maximum pressure of powder gases	1880 kg/cm ²
— Air pressure in tyres	1,5 Atm.
— Width of the track	1280 mm
— Life of barrel (with fourth charge) appr.	15000 rounds

b) Weight data:

— Weight of the gun in firing position	705 kg
— Weight of the barrel	78 kg
— Weight of the mantle	71 kg
— Weight of the wheels (both with suspension springs)	110 kg
— Weight of the carriage body	101,5 kg
— Weight of the shields	49 kg
— Weight of the breechring with breechblock	73 kg
— Weight of the carriage trails and towing lunette with fork	100 kg
— Weight of the cradle	91 kg

c) Dimensional data:

— Length of the gun in firing position	3070 mm
— Length of the gun in traveling position	2420 mm
— Width in firing position	2650 mm
— Height of the gun at elevation of 45°	1670 mm
— Height of the barrel bore axis	730 mm
— Clearance	180 mm

2. SIGHTING EQUIPMENT

Range quadrant for Mountain Gun 76 mm M48 B1

The range quadrant has a dependent line of sight. The drift is not automatically eliminated and therefore a corresponding deflection correction shall be taken from column 17 for each charge respectively.

It is provided with two scales — in mils and in meters, respectively graduations.

The scale in mils is provided with a scale (in the form of an arc) and a micrometer. The scale is graduated from 0 to 8. Each interval equals 100 mils. The micrometer scale is graduated to 100 intervals. The reading accuracy being 1 mil.

The value of the graduation of the scale in meters ($\Delta X = 50$ m) is applicable to the High explosive shell 76 mm M50 and approximately to the third increment charge of round БОФ-357М, while for other shells and propelling charges the range quadrant has to be set according to the data from column 2 table II. Up to 140, every other interval on the scale is marked with a number, after which each subsequent one is marked on. The end interval is 155.

The site drum is graduated from 29 to 35. The value of an interval being 100 mils. The micrometer scale is graduated to 100 intervals. The reading accuracy is 1 mil.

The value of the interval is 1/6400 part of the circumference of the circle.

The zero position of the site drum is 32-00.

Remark:

The range quadrant with graduations from 0 to 1200/000 does not have a scale in meters (graduations).

Panoramic telescope M57

The panoramic telescope is provided with two drums, one stationary and one mobile. They are graduated in 64 intervals each of 100 mils. The micrometer is graduated to 100 mils. The reading accuracy is 1 mil.

The zero position is 32-00.

The graduations on the drum increase in counter-clockwise direction.

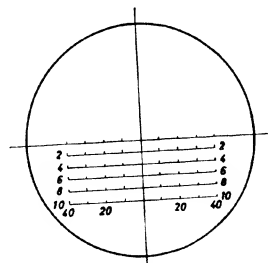
Apart from the panoramic micrometer there is a scale for deflection corrections to the right and left of 20 mils respectively. The reading accuracy is 1 mil.

Within the panoramic telescope the reticle is engraved for setting of the ranges and lead. By means of the reticle, ranges to 1000 meters could be set. The ranges in even hundreds of meters are marked with horizontal lines and appropriate numbers.

The reticle is engraved for firing with the high explosive anti-tank shell 76 mm M50, but the values on the reticle correspond approximately for the third increment charge of the high explosive shell M55 and OF-350.

For setting of lead, the horizontal lines are divided by stripes on each 10 mils (a total of 8 stripes of 10 mils each = 80 mils).

Under the horizontal stripe, indicating the range of 1000 meters, numbers of mils to deflection: 20 and 40 to the right and left are marked (drawing 1).



Drwg. 1

Note: This gun can be provided with a panoramic telescope with a drum graduated to 32-00 also, while the numbers indicating the intervals increase in counter clockwise direction.

Gunner's Quadrant

For the 76 mm Gun M48 B-1, the gunner's quadrant M50 is designed, in mils equal to 1/6400 of the circumference of the circle. The reading accuracy is 1 mil. The initial setting is 0 (zero). The value of the interval on the drum is 10 mils, and on the micrometer 1 mil.

For low-angle fire, the reading is made on the scales of the drum and micrometer marked with »0-800« (in black), and the gunner's quadrant is placed on the quadrant plate of the gun so that the arrow (pointer) on the side of the gunner's quadrant marked with »0-800« is facing the direction of firing.

For high-angle fire on the drum scale graduations, marked in red with numbers from 900—1600, are set and on the micrometer on the ones marked in red (over which is the inscription in red: »800—1600« (and the gunner's quadrant is placed on the quadrant plate of the gun so that pointer on the side of the gunner's quadrant marked with »800—1600« is facing the firing direction.

PART III

AMMUNITION

1. ROUND

a) The semi-fixed round BOΦ-357M, namely marked with VOF-357M¹⁾ (Fig. 1 and 2) is a standard round for 76 mm GUN M48 B-1 and can be completed with:

- High-explosive shell M55 with fuze UTU, M51A5, or
- High-explosive shell marked with OΦ-350, namely OF-350 (HE) with fuze KTM-1 (Fig. 1).

The round is provided with 5 grams of alloy preventing coppering of the barrel.

The round is completed with the base (first) charge and three increment charges within the case.²⁾

b) The round YBII-357M, namely marked with UBP-357M (fig. 4) with high-explosive anti-tank shell marked with BII-350/2, namely BP-350/2 is a fixed round.

2. SHELLS

a) The high-explosive shell M55 is completed with fuze UTU, M51A5 (fig. 6), which is heavier than the fuze KTM-1 for 0,591 kg.

¹⁾ This is the same round, only with different marking. This note is applicable to other elements of the round too.

²⁾ There are round VOF-357M with high-explosive shell OF-350 which are completed with base (first) and only two increment charges.

The shell is painted with olive drab paint and the marking is applied with yellow paint. The marking on the shell is as follows:

T
76 mm M48 B-1
M.55
TB 5901-1

The weight marks are applied above letter »T«.

Firing with this shell is performed according to table II. Marking of the shell is shown on drawing 3c.

b) High explosive shell marked with OF-350, namely OF-350 (HE) (fig. 1) is completed with fuze KTM-1 (fig. 7) which is packed in the same case, but separately from shell (unscrewed). This shell according to the ballistic properties is similar to shell M55.

The shell is loaded with trinitrotoluene (TNT). It is painted with grey paint.

On the high explosive shell marked with OF-350 (HE) is the following marking:

76 mm
HE, OF-350
TNT
LOT KYU-5801-4

The weight marks are shown below this marking.

Firing with this shell is also performed according to table II, providing that at firing with the second, third and fourth increment charge without the cap on fuze KTM-1, the range correction from column 22, and at firing with third and fourth increment charge with the cap on fuze KTM-1, the range correction from column 22a, shall be taken.

c) High explosive anti-tank shell БП-350/2, namely BP-350/2 (fig. 4) is completed with fuze K-451 (fig. 8) and is loaded with trinitrotoluene and hexogen TNT and RDX). It is designed for direct firing on tanks up to 500 meters, and exceptionally up to 1000 meters. Direct firing with this shell up to 1000 me-

ters is performed by means of the reticle in the panoramic telescope (drawing 1). If firing on greater ranges is required with this shell, Table II for the third increment charge of the high explosive shell M55, shall be used.

The fuze is packed in the same case but separately from the shell.

SHELLS AND FUZES

Item №	SHELL (projectile)					FUZE			
	Denomination of shell with fuze	Marking	Weight kg	Length cm	Colour	Weight of the explosive charge	Marking	Weight	Mode of effect
1	High-explosive shell M55	M55	6,2	4	Olivegrey	0,429	UTU, M51 A5	0,971	super-quick and delay
2	High-explosive shell OF-350	OF-350 OF-350 (HE)	6,2	4	grey	0,710	KTM-1	0,380	super quick and with delay
3	High-explosive anti-tank shell БП-350/2 or 76 mm M50	БП-350/2 BP-350/2 or 76 mm M50	5,1	—	unpainted	—	K-451	—	Super-quick

3. FUZES

a) FUZE UTU, M51A5 (fig. 6) is designed for the high explosive shell M55. The fuze can function superquick or with delay (0,05 seconds).

In transportation the fuze is set for superquick action (regulator turned toward »SQ«). To set the fuze for delay action the groove on the regulator shall be turned toward mark »DELAY«. The marking on the fuze is:

»FUZE PD, M51A5 .05 sec«

b) Fuze KTM-1 (fig. 7) is designed for the high explosive shell OF-350, namely OF-350 (HE). The fuze has two settings — with the cap (high-explosive effect) and without the cap (superquick effect).

The fuze is armed in the barrel after firing and activated when encountering an obstacle.

c) Fuze K-451 (fig. 8) is designed for the high explosive anti-tank shell marked with BP-350/2, namely BP-350/2. This is a superquick fuze. It is packed separately from the shell.

PROPELLING CHARGE

The propelling charge for the round BOΦ-357M is variable and consists of the base (first) and three increment charges. The round is completed with the fourth increment charge, that is, all four charges are packed in the cartridge case.

Accordingly, for firing with the **fourth** charge the cartridge case is used as it is completed; for firing with the **third** increment charge, one increment charge has to be taken out of the cartridge case; for firing with the **second** charge, two increment charges have to be taken out of the cartridge case; and for firing with the **first** charge, all three increment charges have to be taken out of the cartridge case (only the basic charge remains in the cartridge case).

Some rounds BOΦ-357M with the high explosive shell OF-350 are completed only with the third charge, that is, basic (first) and two increment charges placed in the cartridge case (fig. 2). In this case, for firing with the **third** charge the cartridge case is used as it is completed; for firing with the **second** charge, one increment charge has to be taken out of the cartridge case, and for firing with the **first** charge, both increment charges have to be taken out of the cartridge case. For firing with the fourth charge one increment charge has to be added in the cartridge case (either that one which is carried separately, or one of those taken out from the cartridge case when the firing was performed with the first or second charge).

After taking out or adding the increment charges the cardboard cover shall again be placed in the cartridge case.

The propelling charge for shell M55 is NC-22 and NC-24 powder (NC-22 for the basic charge, and NC-24 for the increment charge)¹⁾, namely only of powder NC-24.

The powders marked with NC-22 and NC-24 are single perforated, polished and graphite glazed.

PROPELLING CHARGES SURVEY

Item №	Round		Propelling charge						Note
	Denomination	Weight kg	Powder mark	Composition	Weight gr	V ₀ m/s	P _{max} kg cm ²	Range	
1	Semi-fixed round BOΦ-357M (VOF-357M) with High explosive Shell M55	8,2	NC-22 and NC-24	Variable : № 1 (basic) № 2 (190 + 92) № 3 (190 + 2 × 92) № 4 (190 + 3 × 92)	190 282 374 466	222 288 343 398		4080 6145 7740 8600	Exact weight of propelling charge depends of powder lot
			NC-24	№ 1 (basic) № 2 (175 + 95) № 3 (175 + 2 × 95) № 4 (175 + 3 × 95)	175 270 365 460	222 288 343 398		4080 6145 7740 8600	
2	Semi-fixed round BOΦ-357M (VOF-357M) high-explosive Shell OF-350 (OF-350)	8,2	4/1 or K 41	№ 1 (basic) № 2 (190 + 92) № 3 (190 + 2 × 92) № 4 (190 + 3 × 92)	190 282 374 466	222 288 343 398		4080 6240 7920 8860	For direct firing
			K/41 or 4/1	Fixed (in the cartridge case)	360	346		1000	
	Fixed round VBP-357M (UBP-357M) with High explosive anti-tank Shell BP-350/2 (BP-350/2)	—	K/41 or 4/1	Fixed (in the cartridge case)	360	346		1000	

¹⁾ If the propelling charge is composed of powder NC-22 (namely NC-22/S) and powder NC-24, then the basic charge is of powder NC-22 (namely NC-22/S) and the increment charges of powder NC-24.

The propelling charge for shell marked with OF-350 is of nitrocellulose powder marked with 4/1 (single perforated, unpolished and not graphite glazed powder) or marked with K/41 (single perforated, polished and graphite glazed).

It is not preferable to fire with the fourth charge of the VOF-357M with elevations below 10°.

Propelling charge for high explosive anti-tank shell BP-350/2 is permanently in the cartridge case. The powder is NC-24.

The marking on the propellant bag is as follows:

76 mm M48 B-1
NC-24 MB 5601
1.56 — 131
360 gr

5. STAMPING AND MARKING OF THE AMMUNITION

The shell bodies, fuzes and cartridge cases bear stamped identification marks. These marks have a producing character, showing data about the factory, material, year of manufacture and inspection on production of the respective element.

On the base of the cartridge case is stamped:

76 mm B-1 — for the high-explosive shell OF-350 or high explosive shell M55.

76 mm KYM — for the high-explosive antitank shell BP-350/2.

On the shells, after painting, as well as on the cartridge cases and propellant bags, marks are inserted in numbers and letters in colour. These marks are designed to provide the firing operator with the necessary data about the element concerned, as well as for sorting out of the ammunition of the firing position.

On the cartridge case of round VOF-357M the following data are applied:

- Name of the round
- Caliber and model of the weapon

- Composition of the powder charge, factory and lot number of the powder
- Filling lot number of the ammunition, year of manufacture, and factory mark.

6. PACKING OF THE AMMUNITION

Two semi-fixed rounds VOF-357M are packed in a metal case, each round is packed in a cardboard container. The round UBP-357M is packed in the same manner.

7. WEIGHT ZONE MARKINGS

Marking	Weight/kg		Difference in weight in %
	High-explosive shell M55 and OF-350	High explosive anti-tank shell M50 or BP-350/2	
++++	6,344 — 6,386	5,219 — 5,253	+2 1/3 % to +3 %
+++	6,303 — 6,344	5,185 — 5,219	+1 2/3 % to +2 1/3 %
++	6,262 — 6,303	5,151 — 5,185	+1 % to +1 2/3 %
+	6,220 — 6,262	5,117 — 5,161	+0 1/3 % to +1 %
N	6,180 — 6,220	5,083 — 5,117	± 1/8 (normal)
—	6,180 — 6,138	5,083 — 5,049	1/3 % to -1 %
--	6,138 — 6,097	5,049 — 5,015	-1 % to -1 2/3 %
---	6,097 — 6,057	5,015 — 4,981	-1 2/3 % to -2 1/3 %
----	6,057 — 6,014	4,981 — 4,947	-2 1/3 % to -3 %

PART IV

PREPARATION OF THE GUN FOR FIRING

1. CHECKING OF THE HYDRAULIC RECOIL BRAKE AND RECUPERATOR

Prior to firing the following should be checked:

- Recoil length regulator
- Counter-recoil speed regulator
- Amount of fluid in the recoil mechanism
- Amount of fluid and air pressure in the recuperator
- Whether the suspension springs are disconnected
- Sighting equipment.

Checking of the recoil length regulator

The recoil length regulator is properly assembled if, with the barrel at zero position, the pointer on the regulator rod is accurately matched with the pointer on the bracket, in which case all the pointers on the recoil mechanism counterrecoil rod and on the arc racks are matched with the appropriate pointers (if the pointer on the rod has not already been displaced due to the regulation of the recoil length). In that case, the respective value of displacement has to be recorded in the gun book.

In case the regulator is not properly assembled proceed as follows:

- Lay the barrel at zero elevation using the gunner's quadrant.

- Remove the protecting cover from the cradle front part.
- Remove the nut from the counter-piston rod.
- Remove the gear segment.
- Turn the counter-piston rod assembly until the index on the front section is matched with the pointer.
- Set the gear segments to match the pointer.
- Reinstall the nut on the counter-piston rod.

Normal recoil length would be achieved only with the regulator in proper position.

In order to adjust the recoil length during firing, the regulator is provided with an adjusting nut connecting both parts of the regulator rod.

If the recoil length is to be shortened, the regulating nut should be turned to the outer side so that the regulator rods could be shortened too.

For obtaining a longer recoil length, the nut should be turned to the inner side.

Checking of the counter-recoil speed regulator

Before firing, the counter-recoil speed regulator should be set so that the mark »H« (normal) coincides with the index. In that position of the regulator, the wrench should be turned vertically downward.

If, during firing the barrel returns too quickly, the regulator wrench should be turned to the left, until the mark »Z« coincides with the index, and if the barrel returns too slowly, and the counter-recoil speed has to be increased, the regulator wrench should be turned to the right until the mark »O« coincides with the index.

Checking of the amount of fluid in the recoil mechanism

The recoil mechanism contains a fluid reserve of 50 cm³ in the compensator.

For checking of the fluid amount in the recoil brake, the following should be adhered to:

- Set the cradle at the highest elevation.
- Remove the protecting cover from the front part of the cradle.

— Loosen the valve stem, marked with »B« for 2—3 turns, and if some fluid appears it indicates that there is some reserve fluid in the compensator.

— Sufficient amount of reserve fluid is provided in the compensator, if the compensator spring is compressed to such an extent that 4—5 coils of the spring are visible through the opening in the cradle. When less than 4 coils are visible, more fluid should be added.

In case the recoil mechanism has not a sufficient fluid reserve, proceed as follows:

— Loosen the valve stem with T screw and fill up the reserve fluid through a funnel until appearing on the opening.

— Screw in the valve stem, unscrew the T screw and by means of a pump force the reserve fluid in the compensator (50 cm³), compressing thus the compensator spring to such an extent that 5 coils will be visible through the opening.

If only reserve fluid should be refilled, it is not necessary to loosen the valve stem, but only the T screw, screwing the pump instead and adding the fluid.

Checking of the recuperator

When checking the recuperator, it is necessary to verify whether there is fluid enough and whether the nitrogen pressure is normal.

Checking of the amount of fluid in the recuperator

In order to refill fluid in the recuperator, proceed as follows:

— Unscrew the screw from the counter-recoil speed regulator head.

— Unscrew the screw from the regulator shaft.

— Remove the rubber plug from the regulator shaft.

— Screw in the pump for refilling of the fluid in the stuffing box.

— Add fluid in the recuperator by means of the pump.

If the regulator shaft protrudes from its seating it means that there is little fluid in the recuperator.

If the regulator shaft protrudes from the stuffing box for appr. 8 mm, firing should be stopped and appr. 200 cm³ of fluid added in the recuperator.

After each refilling, artificial recoiling should be performed over a length of 830 mm.

Checking of the nitrogen-pressure in the recuperator

In order to check the nitrogen pressure in the recuperator, proceed as follows:

— Make sure that there is fluid enough in the recuperator and if necessary refill it up to the normal level and

— Remove the screw from the valve housing cover on the front left end of the cradle

— Unscrew the plug of the adapter seat.

— Screw in the adapter with air pressure gauge.

— Slowly open the valve allowing the air from the recuperator to enter the air pressure gauge.

— Read the air pressure on the gauge and close the valve.

If the nitrogen pressure is less than normal, proceed as follows:

— Connect an air pump or nitrogen pressure cylinder to the adapter.

— Slowly loosen the valve for 2—3 turns.

— Slowly expel the nitrogen from the cylinder or pump up until the air pressure gauge shows normal pressure.

— Replace the valve

— Remove the adapter with the air pressure gauge and

— Install and lock the valve housing cover.

If pressure in the recuperator exceeds the normal, one, expel it slowly, carefully observing the air pressure gauge.

After each increase of pressure, it should be checked on the counter-recoil speed regulator shaft whether there is sufficient fluid in the recuperator, and if not, it should be added up, checking again the pressure in the recuperator.

2. CHECKING OF SIGHTING EQUIPMENT

The sighting equipment is correct if the optical axis of the panoramic telescope is horizontal and parallel to the barrel bore axis, providing that the sighting equipment has been set

at zero position (initial set-up) (azimuth-scale, elevation drum, angle of site mechanism and range quadrant), while the angle of site mechanism level and the cross level are centered to bubble.

For checking of the sighting equipment, the gun should be emplaced on level ground. A hard support should be placed under the carriage tail. Prior to checking of the sighting equipment the elevating and traversing mechanism should be checked and all troubles thereof remedied, excessive lubricant removed and the quadrant plate wiped clean. The sighting equipment shall be inspected and the deficient parts replaced.

Checking of the gunner's quadrant

Carefully wipe up the quadrant plate. Place the gunner's quadrant parallel to the barrel bore axis and center its level to bubble by means of the elevating mechanism, then reverse it for 180°.

If the level bubbles even then, the instrument is correct. If not, it should be recentered by means of the adjustment screw, noting the difference in reading. Half of the difference should be corrected by means of the quadrant adjustment screw and half by means of the elevating mechanism.

This procedure should be repeated until the bubble remains centered after turning round the quadrant for 180°.

Checking of the zero position of the range quadrant

For checking of the zero position of the range quadrant, proceed as follows:

- Place the gunner's quadrant on the quadrant plate, parallel to the bore of the gun.
- Center the bubble of the gunner's quadrant with graduation 0 using the elevating mechanism.
- Place the gunner's quadrant onto the panoramic telescope mount parallel to the angle of site mechanism level axis.
- Center the bubble of the angle of site mechanism level by turning the range quadrant spindle.
- Center the angle of site level by turning micrometer scale of the angle of site mechanism.

— Turn the gunner's quadrant for 90° and center the bubble of the gunner's quadrant level by means of the cross levelling mechanism spindle.

After these operations the readings on the range quadrant should be:

- The drum and micrometer pointers alined at »0« on the mil scale.
- Angle of site 32-00.
- The angle of site level and cross level centered to bubble.

If this is not the case, then:

- Loosen two screws and aline the »0« on the drum with the pointer;
- Loosen three screws on the range quadrant spindle and aline the 0 on the range quadrant micrometer scale with the pointer.
- Loosen two screws on the angle of site mechanism drum and aline the division 32 with the pointer.
- Loosen the screw on the angle of site spindle and aline the 0 on the angle of site micrometer scale with the pointer.
- If the cross level is not centered, loosen the screws and center the bubble.

As soon as any of the above operations is performed, the screws should be re-tightened.

~~Then:~~

Checking of the zero position of the line of sight

For checking of the zero position of the line of sight, the following should be adhered to:

- Place the gun, using the gunner's quadrant, so that the cradle trunnions are horizontal.
- Stretch cross hairs across the face of the muzzle brake.
- Remove the firing mechanism parts.
- Bore-sight through the firing pin hole through the cross hairs on the muzzle brake on an aiming point at a distance not less than 400 meters.
- Sight with the panoramic telescope on the same aiming point (drum, micrometer and elevation drum).

After sighting on an aiming point, the panoramic telescope should read 32-00 and the elevation drum 0.

If this is not the case then:

— Loosen two screws locking the drum pointer and line the line with the number 32 on the drum, then tighten the screws.

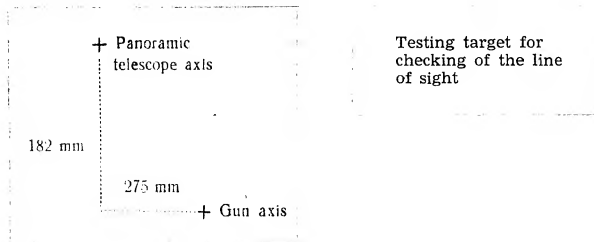
— Loosen the micrometer locking screw and turn the 0 of the micrometer to the pointer.

— Loosen three screws of the elevation micrometer and align 0 with the pointer.

Checking of the zero position of the line of sight using the testing target

If a suitable aiming point is not available, checking of the zero position of the line of sight is made by means of the testing target, located at a distance of 40 meters in front of the gun, approximately in level with the muzzle.

The relation of the optical axis and barrel bore axis is:



Bore-sight to the right cross on the testing target and sight through the panoramic telescope to the left cross.

The rest of the procedure is same as by checking the aiming point.

2. LOSS IN MUZZLE VELOCITY (V_0) DUE TO INCREASED LENGTH OF THE POWDER CHAMBER

Take the round with high-eplosive shell OF-350, defuze the shell and take off the primer and the propelling charge from the cartidge case and ram the shell into the barrel. Insert

the cartridge case in the cartridge seating until its rim rests on the barrel. Insert a rod through the primer seating so that its end rests on the shell base and make a mark on the rod to indicate how far reaches the outer surface of the cartridge case base. Read off or measure the length obtained with an accuracy of 1 mm and deduct 306 mm from that length, thus obtaining the value of the increased length of the powder chamber. The following table gives the loss in muzzle velocity V_0 due to the increased length of the powder chamber.

Increase of length of powder chamber in mm	2	4	6	8	10	12	14	16	18
1	1,1	2,5	4,2	6,4	8,9	11,7	14,7	18,0	21,4
2	1,5	3,3	5,2	7,4	9,9	12,6	15,6	18,7	21,9
3	2,0	4,0	6,1	8,3	10,7	13,4	16,2	19,2	22,4
4	3,3	6,2	8,8	11,3	13,7	16,2	18,6	20,2	23,3

Remark: Data in this table are obtained by parallel firing during 1960, with barrels of various degree of wear.

PART V

METRO MESSAGE

The metro-data are taken from the metro message AMS usually given in the form of telephonogram as follows:

E.g.
»Metro-firing: 170805-0084-51567-02-695204-04-685304-08-675507-12-995910 etc. and finally 0906«.

The metro message can be given in cipher being emitted in letters.

The meaning of figures and letters is determined according to their place in each group and by the place of the group in the telephonogram:

- I group (6 figures) = Day in the month (17) = 17th
170805 Time of observation (08) = eight o'clock
Minute of observation (05) = 5 minutes
- II group (4 figures) = Altitude of the meteo-station (0084 =
0084 = 84 meters)
- III group (5 figures) = Difference in barometric pressure on
51567 ground level (67) = - 17°
- IV group (2 figures) = Altitude of trajectory in hundreds of
02 meters (02) = 200 m
- V group (6 figures) = Ballistical difference in air tempera-
695204 ture for that trajectory (69) = - 19°
Direction angle of the ballistical wind
for the same trajectory (52) = 52-00
Speed of the ballistical wind
(04) = 4 m/sec.

1. The following two-figure groups indicate the altitude of the trajectory in hundreds of meters, as well as the fourth group, while the six-figure groups indicate the ballistical variation of the air temperature, direction and speed of the ballistical wind as well as the fifth group.

2. If any group of figures, at the time of measuring-observation by the meteo-firing station is expressed by a smaller number of figures than foreseen, the places of the missing figures are filled up with zero in front of the existing number (e.g.: Altitude of the meteo-station 84 m. being emitted as 0084).

The sign »-« for negative values of differences in barometric pressure or air temperature is not being emitted. In that case instead of the »-« sign in front of the first figure of the numerals stated for the difference in pressure or temperature, the conditional (arithmetical) number 5 is added — E.g.: difference in pressure - 15 mm, emitted as 515 and the difference + 15 mm as 015; difference in air temperature - 17°, emitted as 67; difference at - 7° emitted as 57 and the difference + 7° as 07.

3. At the end of the metro message an addition is entered in the form of four-figure groups, where the two former figures indicate the altitude in hundreds of meters, starting from the one from which the wind data at various altitudes are obtained by extrapolation of direct measurements, and the two latter figures indicate the period of serviceability (validity) of the metro message in hours, reckoning from the time stated at the beginning of the message.

E.g. 0906 — Over 900 m the wind data are obtained by extrapolation (09).

The serviceability period of the metro message is designed to be 6 hours (06).

4. The difference in atmospheric pressure is taken from the third group of figures in the metro message being reduced to the altitude of the firing position, as a rule: per each 10 m of difference in altitude of the firing position (VP), the pressure would change for 1 mm. This correction should be added to the difference in pressure, taken from the metro message if the firing position is below the meteo-firing station or subtracted if the firing position is above it.

Computation of the barometric pressure for the firing position can be made also according to the table XIa and XIb.

5. Difference in ballistic temperature of air, direction and speed of the ballistic wind is taken from the metro message according to the altitude of the trajectory.

6. From the direction angle of the line of fire (of the target) the direction angle of the ballistic wind should be deducted, and the «angle of wind» for decomposition into components obtained, according to the Table VI.

7. For emitting of the metro message by means of radio or wireless, the figures in the metro message are written in order, being then divided into five-figure groups. In order to decipher such a message, reverse procedure should be used, i.e. the figures are transcribed in order, being then divided into groups of the plain metro message.

PART VI

DIRECTION FOR USE OF FIRING TABLES

A) BASIC TABLES

The basic tables give the initial range quadrant setting, as well as the ballistic elements of the trajectory and data for the correction for range and deflection due to meteorological and ballistic conditions of firing for each hundreds of meters in range. Basic tables for all the charges have a common Table I, and the Table II, for each charge.

Use of the Table I

This table serves for selection of the charges and initial range quadrant setting. The charge shall be selected with a view to obtaining the most favourable effect of the projectile on the target and enabling making of corrections.

A lesser charge, securing effect at a given range should always be taken, since the wear of the barrel is thus reduced.

For firing on live targets with shells with PD superquick fuze or firing on observation posts and firing points with shell with delay fuze always select the charge giving greater angles of fall.

For ricochet firing, the charge giving angles of impact less than 18—22° at a given range should be selected.

During demolition with an exact correction the charge giving the greatest angle of impact and the smallest dispersion should be used.

For firing on armour, use the maximum charge for obtaining higher penetration effect, shorter time of flight and a more grazing trajectory. For demolition of very fortified targets of small dimensions use the appropriate maximum charge.

Use of Table II

The data for each charge are given in Table II separately. The data contained in that table are given in the general order of conventional columns.

Column 1 — contains data for the distance to the target for each 100 meters, and column 1 a in yards.

Column 2 — gives data for the range quadrant intervals. The value of the interval $\Delta X = 50$ m correspond to high explosive anti-tank shell and is applicable to the third charge of round BOΦ-357M. For other propelling charges the number of the interval is given which corresponds to the respective range.

The scale in graduations (meters) is used for firing with the third propelling charge in the case when Firing Tables are not available, providing that one interval corresponds to the change in range for 50 m, 2 intervals = 100 m etc.

For other propelling charges (1, 2 and 4) data for the range quadrant in graduations (meters) are applicable and can be used only when the Firing Tables are available, or abridged firing tables are available.

There are no data in this column for high-angle fire, as the range quadrant is graduated for low-angle fire only.

Column 3 — gives data for the range quadrant in mils (1/6400 of the circumference of the circle).

Column 4 — contains data for the angle of elevation in degrees and minutes. Data from this column are used when firing with the gunner's quadrant in degrees and minutes, either for high or low-angle fire.

Column 6 — contains data for the ordinate of the summit (vertex) of the trajectory in meters for computing of corrections due to wind and for range corrections owing to differences in the air temperature.

Column 7 — contains data for the time of flight in seconds. This column is used for distinguishing own bursts, for

computation of the angle of lead for firing on moving targets and for conducting of planned fire missions.

Column 8 — contains data for the terminal velocity in m/sec., and is used for computing the energy of the point of fall.

Column 9 — contains data for the angle of fall in mils. Data from this column serve for taking of the coefficient according to the Table IV for computation of the probable error range and range bound (displacement) when the target is on slopes. Apart from it, the angle of fall gives the data for computation of the angle of impact, i.e. for evaluation whether ricocheting of the shell would be achieved, if needed, or not achieved if not needed, and for possibility of firing on targets, on rear slopes.

Column 11 — contains data on the value of the probable error range in meters. The value of the probable error range (Vd) on the ground depends on the propelling charge, firing range and angle of slope of the ground. On front slopes Vd is lesser and on the rear ones is greater than the table Vd (epr). The difference between Vd on the ground and the table Vd is computed by means of the Table IV.

The danger area for infantry and the hitting probability factor depend on the Vd value, this factor providing data, according to Table VII, on hitting percents which are to be expected on the target.

Column 12 — contains data on the probable error in deflection Vp in meters. The danger area for infantry and probability factor in flank depend on this value.

Column 13 — contains data on the probable error in height (Vv) when firing on vertical targets. Data for the high angle fire are not available, as firing to vertical targets is not conducted under these angles.

Column 16 — contains data for the table fork, size 4 Vd in mils.

Correction for deflection

Column 17 — contains the correction for deflection in mils for the drift. Owing to the drift the projectile deviates to the right so that the correction should be made to the left.

Column 18 — contains the correction for deflection in mils for lateral wind component $\Delta W_y = 10$ m/sec. The lateral wind component alters the direction, so that the direction should be corrected to the side of the blowing wind and the sense of the lateral component is determined by means of the Table VI based upon the angle and speed of the wind. The method of computing the angle of wind is given with the Table VI.

If the angle of wind is 0-00, the projectile deviates to the right and the correction should be taken to the left. If the angle of wind is from 32-00 to 64-00, the correction should be made to the right.

The components for ballistic wind are taken for the ordinate of the summit of the trajectory. If no data for ballistic wind are available, the ground wind should be taken and the correction computed for 3/4 of the ordinate of the summit of the trajectory.

In order to compute the deflection correction for wind, it is necessary to divide the value from this column by 10 in order to obtain $W_y = 1$ m/sec. and the result should be multiplied by the figure obtained in the Table VI for the lateral component of the wind.

Column 19 — contains the correction for cant of the cradle trunnion. Due to the cant of the cradle trunnion, the projectile deviates to the side of the lower wheel, so that it is necessary to correct the direction to the side of the higher wheel. This column is used only when the cross level is faulty.

Corrections for range

Column 21 — contains the range correction in m due to the longitudinal wind component for $\Delta W_x = 10$ m/sec. The longitudinal wind component alters the range in two ways: increasing it if the wind is blowing in the direction of firing, or shortening it if the wind is blowing in a direction which is opposite to the direction of firing. In the former case, the correction has a negative sign, while in the latter one a positive sign.

If the angle of wind is 0-00 to 16-00 and from 48-00 to 64-00, the wind would be reducing the range and the correction should be added, while in other instances it should be subtracted.

The ballistic wind data are given by the meteo-station. The range corrections for wind are taken for the ordinate of the summit of the trajectory. The value of the longitudinal component of the wind is obtained from the Table VI after decomposing the wind into components. In order to compute the range correction, the value shown in the column 21 should be divided by 10, thus obtaining the value $\Delta W_x = 1$ m/sec. and the result should be multiplied by the number obtained in the Table VI for the longitudinal component of the wind.

If ballistical wind is not available, the ground wind for 3/4 of the ordinate of the summit of the trajectory should be taken.

Column 22 and 22a — contains the data for the range correction when firing with the high explosive shell OF-350 with fuze KTM-1, because the Tables are computed for shell M55 where the range at firing with the second, third and fourth charge is less than of the shell OF-350.

Firing can be performed with high explosive shell OF-350 with the cap screwed on fuze KTM-1 or without the cap. At firing with the third and fourth propelling charge with the cap screwed on the fuze, the range of the shell is less. Therefore, in column 22, data for the range correction for shell OF-350 are given when firing **without the cap** on the fuze (superquick action), namely for the second, third and fourth propelling charge, and in column 22a, data for the range correction for the same shell when firing **with the cap screwed on the fuze KTM-1** (delay action), are given, namely only for the third and fourth propelling charge, because when firing with the first and second propelling charge there is no significant difference when firing with or without the cap on the fuze KTM-1.

In both cases (with or without the cap on the fuze KTM-1) the range of the high explosive shell OF-350 is greater than the range of the high explosive shell M55 and therefore the range correction is with sign «-» (minus).

Example: Firing is made with high explosive shell OF-350 with fuze KTM-1, fourth propelling charge, low-angle firing, target in horizon of the weapon, topographic range 5900 meters.

In the Firing Tables for HE shell M55, 4 charge, $T = 326/000$ (column 3). For HE shell OF-350 the range correction shall be made, namely:

a) from column 22 when firing **without the cap** on fuze KTM-1 for — 145 m; that is $5900 - 145 = 5755$ m, T for 5755 = 315/000 (from column 3); with T = 315/000 HE shell OF-350 without the cap on fuze KTM-1 will have the range of 5900 m.;

b) from column 22a when firing **with the cap** on fuze KTM-1 for — 90; that is $5900 - 90 = 5810$ m; T for 5810 m = 319/000 (from column 3); with T = 319/000 HE shell OF-350 with cap on fuze KTM-1 have the range of 5900 m.

Note: In high-angle fire, T for HE shell OF-350 will be greater. For example, at firing with the 4 charge on 7800 m, T for HE shell M55 is 1024/000, and for HE shell OF-350 will be:

a) when firing without the cap on fuze KTM-1, T will be $(7800 - 273) = 7527$ m ... 1061/000;

b) when firing with the cap on fuze KTM-1, T = $(7800 - 138) = 7662$ m ... 1944/000.

Column 23 — contains the range correction in m due to difference in air temperature for $\Delta t^0 = 10^0\text{C}$.

If the temperature is higher than the normal one, the atmosphere is denser and the range would be increased, the correction sign being minus and vice-versa.

An increase of temperature by 10^0 reduces the air density by 45 grams, and for a difference in altitude of 180 meters, the temperature would be reduced by 1^0 . Inasmuch as the altitude increases, the temperature decreases.

The differences in air temperature are given in the metro-message of the meteo-station for different strata of the atmosphere.

In order to compute the range correction due to air temperature differences, the value from this column should be divided by 10 in order to obtain $\Delta t^0 = 1^0\text{C}$ and the result should be multiplied by the difference in temperature at the summit of the trajectory (ordinate of the summit of the trajectory).

Column 24 — contains the range correction in m due to the difference in barometric pressure for $\Delta H = 10$ mm. The normal barometric pressure is 750 mm. The meteo-station gives the difference in barometric pressure for its own altitude. If the altitude of the meteo-station differs from that of the firing position $VP = FP$, it is necessary to reduce the difference in barometric pressure to the altitude of the firing position VP

= FP, it is necessary to reduce the difference in barometric pressure to the altitude of the firing position $VP = FP$. Therefore, the difference in barometric pressure, obtained by the metro message, should be added the difference in altitude of the meteo-station with its mathematic sign, divided by 10 beforehand, or use the Table Xa and Xb.

The barometric pressure uniformly decreases with the increase of height by appr. 1 mm per each 10 m of altitude, i.e. the greater is the altitude, the lesser is the pressure.

If the difference in barometric pressure is negative, the atmosphere is denser, the projectile will fly farther and the correction should be deducted and vice-versa.

In order to compute the range correction, it is necessary to divide the value from this column by 10, thus obtaining $H = 1$ mm and the result should be multiplied by the difference in barometric pressure reduced to the firing position.

Column 25 — contains the range correction in m due to the difference in muzzle velocity for $\Delta V_0 = 10$ m/sec. From this column, the correction for variation of the muzzle velocity from the table velocity is taken.

A greater muzzle velocity gives a greater range so that the correction should be deducted and vice-versa.

The loss in muzzle velocity owing to increased length of the powder chamber, other type of propellant and other causes (relative behaviour of the weapon) should be entered in the gun book.

If the difference of the muzzle velocity from the table is known, the value obtained from this column should be multiplied by the difference between the actual and the table muzzle velocity.

Column 26 — contains the range correction in m due to the difference in powder temperature for $\Delta t^0 p = 10^0\text{C}$. The higher is the temperature, the greater is the muzzle velocity and the correction will be negative and vice-versa.

In order to compute the correction due to the difference in powder temperature, the value from this column should be divided by 10 and multiplied by the difference between the actual and table powder temperature.

Column 27 — contains the range corrections in meters due to the difference in weight of the projectile, from the nor-

mal one for $\Delta p = 2$ marks. The corrections are exactly computed for a 100 gr. difference in weight which is practically between 2—3 marks. The values for corrections for 1 mark are very small.

The heavier is the projectile, the lesser are the muzzle velocity and air resistance and vice-versa. A lesser muzzle velocity gives a lesser range, while a lesser air resistance gives a greater range. The total correction is equal to the sum of corrections due to difference in muzzle velocity and air resistance. On shorter ranges, this correction is more emphasized due to influence of the projectile weight on the muzzle velocity and the correction sign is positive; on longer ranges a smaller resistance is more emphasized, so that the range will be greater and the correction sign negative.

In order to compute the correction for difference in the weight of the projectile, it is necessary to multiply half of the value from this column by the number of the weight marks.

Practically, it is not necessary to consider the correction for mark 1, but if there are 2 or 3 marks, this column should be used.

The mathematical sign for the correction is shown in the respective column and is applied to two signs »+«; if the sign is »-« the value from this column has an opposite sign.

Column 33 — contains the value of displacement of the point of fall in range in m if the elevation is changed for 1 mil.

Column 34 — contains the value of displacement of the point of fall in height in m if the elevation is changed for 1 mil. For high-angle fire these data are not available owing to great sloping of the trajectory.

B) AUXILIARY TABLES

Use of the Table III

This table contains the angle of site with the appropriate correction of the angle of elevation due to the angle of site of the target ($S + pS$) for a value of the angle of elevation and angle of site for each propelling charge.

Table IIIa serves for determination of the angle of site with appropriate correction when the target is located above the battery (the angle of site is positive) and the Table IIIb is used for targets located below the battery (angle of site is negative).

The correction of the angle of elevation due to the angle of site has the same sign as the angle of site. Data from this table are set on the angle of site scale. If the corrected angle of site is algebraically added to the elevation, the angle of elevation obtained is:

$$E = T \pm S \pm pS$$

If the angle of site values with correction $+(S + pS)$ or $-(S + pS)$ are greater than 300/000, set 300/000 on the angle of site scale, and other elements on the range quadrant.

By high-angle fire, the Table IIIc is used when the angle of site is $+$, and Table IIId when the angle of site is negative in the following way:

— When the angle of site is positive, the value from the Table IIIc should be deducted from the angle of elevation.

— When the angle of site is negative, the value from the Table IIId should be added to the elevation.

The elevation obtained is set on the gunner's quadrant as follows:

The Tables IIIa and IIIb, are given:

— For the 1. and 2. charge — one and

— For the 3. and 4. charge — one (since the pS differences for the charges are very small).

The Tables IIIc and IIId are given:

— For 1. charge — one, and

— For 2. 3 and 4 charge — one.

Examples: 1. By low-angle fire with HE shell M55, third charge range 5000 meters, for $S = + 80/000$, E will be:

$$E = T + (S + pS) = 307 + 85 = 392/000 \text{ (according to table IIIa).}$$

For $S = -80/000$, E will be:

$$E = T - (S + pS) = 307 - 84 = 223/000 \text{ (according to table IIIb),}$$

2. When firing with the same shell, fourth charge, high-angle fire, range 8000 meters and $S = +60/000$, will be:
 $E = T + (S - pS) = 993 - 54 = 939/000$ (according to table IIIc).
 For $S = -60/000$, E will be:
 $E = T - (S + pS) = 993 + 34 = 1027/000$ (according to Table IIIc).

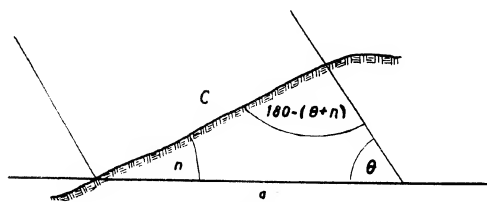
Use of Table IV

This table contains the value of the coefficient to be multiplied by the values of probable table errors and displacements in range, when the target is located on the front (+n) or rear slope (-n).

The values for the ranges and probable errors given in the Table II are applicable only when the target is located on horizontal ground.

If the target is located on the front slope the probable error and displacement on the ground would be decreasing and if the target is on the rear slope, they would be increasing.

a) Coefficient λ for the front slope is less than one unit:



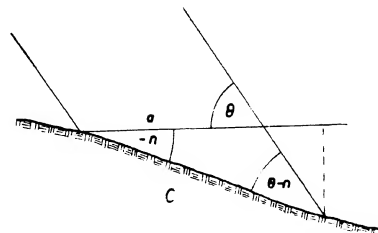
Drwg. 2

$c : a = \sin \theta : \sin [180 - (\theta + n)]$ since
 $\sin [180 - (\theta + n)] = \sin (\theta + n)$ that is

$$c = a \frac{\sin \theta}{\sin (\theta + n)} \text{ and if } \frac{\sin \theta}{\sin (\theta + n)}$$

then $c = a \lambda$

b) Coefficient λ' for the rear slope is greater than 1:



Drwg. 3

$c : a = \sin (180 - \theta) : \sin (\theta - n)$
 since the $\sin (180 - \theta) = \sin \theta$ that is

$$c = a \frac{\sin \theta}{\sin (\theta - n)} \text{ if } \frac{\sin \theta}{\sin (\theta - n)} \text{ par } \lambda'$$

then $c = a \lambda'$

The values λ and λ' depend on the angle of fall and slope of the ground. The last vertical column of the table IV gives the values of the coefficient when firing on vertical targets. By means of these values, the probable error in height can be computed:

$$E_{ph} = E_{pr} \lambda$$

where $\lambda = \tan \theta$

The sloping of the ground in % is computed by dividing the variation in altitude of 2 points with the horizontal distance and multiplying the result obtained by 100.

Example: For firing with the fourth charge at 6200 m ($\theta = 452/000 = 25^{\circ}25'$) the displacement on the range quadrant should be computed in order to obtain a jump of 100 m:

- on the front slope ($n = +15\%$) and
- on the rear slope ($n = -15\%$)

- a) For a jump of 100 m. on the front slope a displacement on the range quadrant of:

$$a = \frac{c}{\lambda} = \frac{100}{0,77} = 130 \text{ m } (\approx 11/000) \text{ is required.}$$

- b) For a jump of 100 m on the rear slope a displacement on the range quadrant of:

$$a = \frac{c}{\lambda'} = \frac{100}{1,48} = 67,5 \text{ m } (= 5,7 \approx 6 \text{ 000}) \text{ is required.}$$

Use of Table V

This table contains genuine values of trigonometric functions for angles in mils (1/6400 of the circumference of the circle).

Example: For angle α of 195/000, according to the Table V:

- a) $\tan \alpha = 0,194$
- b) $\sin \alpha = 0,190$
- c) $\cos \alpha = 0,981$

Use of Table VI

The table VI gives data for decomposition of the ballistical wind into components.

On different altitude, the wind has different speed and direction. The wind is artificially determined and the sum of corrections is given as for the actual wind. The wind computed according to strata of the atmosphere is the ballistical wind, being given by the meteo-station.

The wind is computed according to strata in hundreds of meters (200, 400, 800, 1200, 1600, 2000, 2400 and 4000), being given in the fourth figure group in the metro message, while the direction angle of the wind for the same trajectory in hundreds of mils and speed in m/sec. is given in the fifth figure group in the metro message (the last two figures).

The wind affects the direction and range of firing in dependence upon the angle and speed. The angle of wind is the angle between the direction of firing and the direction of the

wind. This angle is measured (in counterclockwise direction) from the firing direction to the direction from which the wind blows.

The angle of wind is equal to the direction angle of the target less the direction angle of the wind shown in the metro message for the attitude corresponding to the ordinate of the summit of the trajectory: $\angle W = \alpha \pi c - \alpha \pi w$.

If the direction angle of the target is less than the direction angle of the wind, it should be increased prior to reduction by 64-00.

For the angle of wind and speed data are taken from the table for the longitudinal and lateral component of the wind.

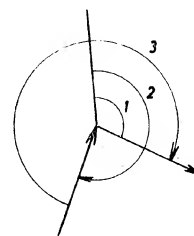
The direction of the wind is computed with an accuracy of 1-00 and speeds of 1 m/sec.

If the strength of the wind is over 10 m/sec. take the value from the column 10 and that of a number which when added to 10 would give the actual strength of the wind.

Example: Direction angle of the target ($\alpha \pi c$) = 29-00 and the direction angle of the wind ($\alpha \pi w$) = 36-00. Angle of the wind = $\alpha \pi c - \alpha \pi w = (29-00 + 64-00) - 36-00 = 57-00$.

If the speed of the wind is 13 m/sec. $W_x = 7,7 \text{ m/s}$ and $W_y = 6,3 \text{ m/s}$.

By a $w = 57-00$ the wind decreases the range and deviates the projectile to the left (see Table VI).



Drwg. 4

- 1 — $\alpha \pi c = 29-00$
- 2 — $\alpha \pi w = 36-00$
- 3 — $\angle W = 57-00$

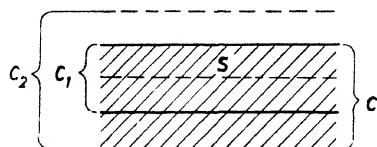
Use of Table VII

This Table contains data for the probability factor which is more favourable viz, greater inasmuch as the probable deflection is smaller.

The % of hits into the target depends on the probability factor.

a) Determination of % of hits by means of the probability factor

— When the mean hit is anywhere in the target



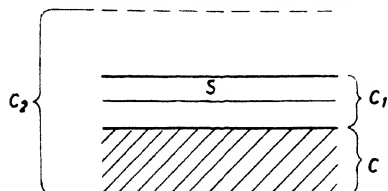
Drwg. 5

$$\text{Target } C = \frac{C_1}{2} + \frac{C_2}{2}$$

$$\text{Factor} = \frac{C}{E_{pr}} = \frac{C_1}{E_{pr}} \text{ namely } \frac{C_2}{E_{pr}}$$

$$P\% = \frac{P_1}{2} + \frac{P_2}{2}$$

— When the mean hit is beyond the target:



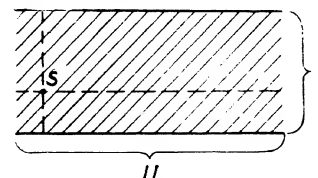
Drwg. 6

$$\text{Target } C = \frac{C_2}{2} - \frac{C_1}{2}$$

$$\text{Factor} = \frac{C_1}{E_{pr}} \text{ namely } \frac{C_2}{E_{pr}}$$

$$P\% = \frac{P_2}{2} - \frac{P_1}{2}$$

— Computation of the percentage of hits on the rectangle target: First the probability for the strip I should be sought and then for the Strip II



Drwg. 7

$$P\% = \frac{P_1 \times P_2}{100}$$

b) Computation of the % of hits by means of the dispersion pattern

2%	7%	16%	25%	25%	16%	7%	2%
1 1	2,5 4,5	7 9	12 13	13 12	9 7	4,5 2,5	1 1

Example: Firing is performed with the HE shell OΦ-350, fourth charge at 4800 met (Vd = 18 m. Vp = 2,6 m). The aim is a bridge of a length of 40 and width of 7 m. The mean shot is reduced by correction to the center of the nearer riband of the bridge. How much shells are to be fired in order to obtain 3 hits into the target if the direction of firing is perpendicular to the direction of the extension of the bridge?

$$P\% = \frac{P_d\%}{100} P_p\% = P_d\% = \frac{c}{E_{pr}} = \frac{14}{18} = 0,78 \quad P\% = 20,8\%$$

$$\frac{P_d}{2} = 10,4\%$$

$$P_p\% = \frac{40}{2,6} = 15,6 \dots \dots 100\%$$

$$P\% = \frac{10,4 \times 100}{100} = 10,4\%$$

It means that, out of 100 shells fired, 10.4 would fall on the bridge, and in order to obtain 3 hits $3 \times 100 : 10.4 = 29$ shells should be fired.

Use of Table VIII

This table contains data for conversion of mils in degrees and minutes.

The values in degrees and minutes for mils from 1 to 99 are shown in the right half of the Table and for conversion, they should be added to the values for hundreds of mils from the left half of the Table.

Use of Table IX

This Table contains data for conversion of degrees in minutes and mils.

The values in mils for the minutes are shown in the right half of the Table and for conversion, they should be added to the values of degrees from the left half of the Table.

Use of Table Xa and Xb

This Table serves for conversion of barometric pressure for the firing position (VP = FP), if the pressure of the AMS (artillery meteo-station) is known as well as difference in altitude of the meteo-station and firing position.

The Table Xa is used when the firing position is above and the Table Xb when it is below the AMS.

Example: The barometric pressure at the AMS is 716 mm. What is the barometric pressure at the firing position if:

a) VP is above the AMS by 180 m and

b) VP is below the AMS by 320 m?

a) From the Table Xa (by interpolation), the pressure VP = 701 m is determined.

b) From the Table Xb (by interpolation), the pressure VP = 744 m is determined.

Use of Table XI

This Table serves for a secure and prompt determination of sign of the deflection and range corrections due to various factors affecting the flight of the projectile.

CONVERSION DATA

1 meter	= 1,094 yards = 3,2808 feet
1 cm	= 0,3937 inch
1 cm ²	= 0,155 in ²
1 cm ³	= 0,061 in ³
1 kg	= 2,2046 pounds
1 gr	= 0,0353 ounces
1 lit.	= 2,128 pints
1 kg/cm ²	= 14,223 lbs/in ²
1 degree	= 17,7778 mils
1 minute	= 0,2963 mils
1 mil	= 3,375 min.
1 mi/hr	= 0,447 m/s
1 ft/sec	= 0,3048 m/sec.
1 Fahrenheit	= 1,8 C + 32
1 C	= 5/9 (Fahrenheit minus 32)

PART VII

BASIC TABLES

HE, SHELL M.55

or

HE SHELL OF-350

and

HE, AT, SHELL BP-350/2

Table 1

SELECTION OF CHARGES
(Low-angle fire)HE Shell M-55 with Fuze UTU, MMA5 and
HE Shell OF-350 with Fuze KTM-1

Range	1. charge $V_0 = 222$ m/s			2. charge $V_0 = 288$ m/s			3. charge $V_0 = 343$ m/s			4. charge $V_0 = 398$ m/s			Range
	Elevation	Angle of fall	Vd (epi)	Elevation	Angle of fall	Vd (epi)	Elevation	Angle of fall	Vd (epi)	Elevation	Angle of fall	Vd (epi)	
m	mils	m	mils	m	mils	m	mils	m	mils	m	mils	m	m
500	54	55	16	31	32	14	24	25	14	18	21	14	500
1000	109	112	17	63	65	14	47	53	14	38	44	14	1000
1500	166	178	20	98	103	14	72	82	14	58	68	14	1500
2000	229	252	23	134	146	16	99	113	15	80	97	14	2000
2500	302	339	27	172	193	18	126	147	16	105	130	14	2500
3000	387	441	29	214	248	21	156	185	17	131	165	15	3000
3500	494	561	32	259	298	24	189	228	19	160	203	16	3500
4000	671	761	36	308	361	27	225	272	20	191	246	17	4000
4500				365	432	31	264	322	23	223	290	18	4500
5000				430	513	35	307	377	25	257	339	19	5000
5500				510	613	40	353	437	28	293	389	20	5500
6000				648	770	46	404	502	32	335	443	22	6000
6500							462	576	37	378	502	24	6500
7000							536	655	42	430	567	26	7000
7500							626	793	47	498	640	29	7500
8000										562	729	32	8000
8500										694	873	36	8500
Max													

SELECTION OF CHARGES
(High-angle fire)

Table 1a

HE Shell M-55 with Fuze UTU, MMA5 and
HE Shell OF-350 with Fuze KTM-1

Range	1. charge $V_0 = 222$ m/s			2. charge $V_0 = 288$ m/s			3. charge $V_0 = 343$ m/s			4. charge $V_0 = 398$ m/s			Range
	Elevation	Angle of fall	Vd (epi)	Elevation	Angle of fall	Vd (epi)	Elevation	Angle of fall	Vd (epi)	Elevation	Angle of fall	Vd (epi)	
m	mils	m	m	mils	m	m	mils	m	m	mils	m	m	m
3000	1156	1237	38										3000
3200	1124	1205	39										3200
3400	1082	1163	39										3400
3600	1032	1115	40										3600
3800	973	1056	40										3800
4000	888	967	40										4000
4200													4200
4400													4400
4600													4600
4800				1140	1226	46							4800
5000				1110	1203	47							5000
5200				1078	1177	48							5200
5400				1041	1147	50							5400
5600				1001	1113	52							5600
5800				954	1073	53							5800
6000				895	1018	53	1147	1241	47				6000
6200							1123	1223	48				6200
6400							1105	1204	49				6400
6600							1089	1184	51				6600
6800							1072	1162	52	1143	1256	49	6800
7000							1054	1138	53	1121	1240	49	7000
7200							979	1110	54	1089	1224	45	7200
7400							939	1075	55	1076	1206	46	7400
7600							883	1028	55	1051	1187	47	7600
7800										1024	1165	47	7800
8000										993	1141	47	8000
8200										954	1111	48	8200
8400										906	1074	48	8400
8500										871	1042	47	8500

Table II

HE SHELL M35 with Fuze UTU, M345 and
HE SHELL OF 350 with Fuze KTM-1

RANGE		Range quadrant		Elevation		Time of flight		Terminal velocity		Angle of fall		Probable error		Fork of 4 cpr
m	yd	mi	mi	deg	m	sec	m/sec	m/sec	m/sec	deg	min	m	ft	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
100	109	5.0	11.3	0°38'	0.5	0.5	220	12	16	0.1	0.2			
200	219	9.2	21.9	1 14	1.3	0.9	238	22	16	0.1	0.3			
300	328	14	32.6	1 50	2.7	1.4	216	33	16	0.2	0.5			
400	437	18	43.3	2 26	4.7	1.9	214	44	16	0.2	0.7			
500	547	23	54.0	3 02	7.2	2.3	213	55	16	0.3	0.8			
600	656	27	64.7	3 38	10	2.8	211	66	16	0.3	1.0			
700	766	32	75.5	4 15	14	3.3	209	77	16	0.3	1.2			
800	875	36	86.5	4 52	18	3.8	208	88	16	0.4	1.4			
900	984	40	97.6	5 29	24	4.2	206	100	16	0.4	1.6			
1000	1094	44	109	6 06	29	4.7	205	112	17	0.5	1.8			
1100	1203	48	120	6 44	35	5.0	203	124	18	0.5	2.1			
1200	1312	52	131	7 23	42	5.6	202	136	18	0.6	2.3			
1300	1422	56	142	8 02	49	6.1	200	150	19	0.6	2.6			
1400	1531	60	154	8 41	57	6.6	199	164	19	0.7	2.9			
1500	1640	63	166	9 20	65	7.1	198	178	20	0.7	3.3			
1600	1750	67	176	10 00	73	7.6	196	192	21	0.8	3.6			
1700	1859	70	190	10 42	82	8.1	195	207	21	0.8	4.0			
1800	1968	74	203	11 25	92	8.6	194	221	22	0.9	4.4			
1900	2077	78	216	12 10	103	9.1	193	236	22	1.0	4.9			
2000	2187	81	228	12 55	117	9.7	192	252	23	1.0	5.4			
2100	2297	85	243	13 41	131	10.3	191	268	24	1.1	5.9			
2200	2407	88	258	14 29	147	10.9	190	285	25	1.2	6.4			
2300	2517	92	274	15 18	163	11.5	189	302	25	1.2	7.0			
2400	2627	96	290	16 08	180	12.1	188	320	26	1.3	7.6			
2500	2737	100	307	17 00	197	12.7	187	339	27	1.4	8.2			

Charge 1

V_i = 222 m/s

CORRECTIONS													
Deflection due to				RANGE DUE TO									
				HE OF 350		Variation of							

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		E. Elevation		Maximum ordinate		Time of flight		Terminal velocity		Angle of fall		Probable error			Fork of 4 epr
		Stripe	Mill			Ys	TE							Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	m	meter	mil	m	meter	m	meter	m	meter
1	1a	2	3	4	6	7	8	9	11	12	13	16					
2600	2843	103	318	17°54'	220	13.3	186	358	27	1.4	8.8						
2700	2953	106	335	18 49	242	14.0	185	377	28	1.5	9.5						
2800	3062	110	352	19 47	264	14.7	185	398	28	1.5	10						
2900	3171	113	370	20 47	290	15.4	184	419	29	1.6	11						
3000	3281	117	388	21 48	318	16.1	183	441	29	1.7	12						21
3100	3390	120	407	22 52	348	16.8	182	463	30	1.8	13						
3200	3500	124	427	24 00	380	17.6	182	486	31	1.8	13						
3300	3609	128	447	25 10	414	18.4	181	510	31	1.9	14						
3400	3718	131	470	26 27	451	19.2	180	535	32	1.9	16						
3500	3828	135	494	27 48	492	20.0	180	561	32	2.0	17						32
3600	3937	138	520	29 14	539	20.9	179	589	33	2.1	18						
3700	4046	141	546	30 45	593	21.9	179	620	34	2.2	20						
3800	4156	144	577	32 28	653	22.9	179	655	34	2.3	22						
3900	4265	148	614	34 32	722	24.3	179	697	35	2.5	25						
4000	4374	151	671	37 45	800	26.1	179	761	36	2.8	29						83
4080	4452	155	800	45 00	1090	30.0	180	892	38	3.6	44						

Charge 1
V₀ = 222 m/s

CORRECTIONS																	Range Change in elevation of 1 mil displaces	RANGE	
Deflection, due to			RANGE, DUE TO																
Dlt	Lateral wind of 10 m/sec	Cant of carriage aside of 10 mil	Rear wind of 10 m/sec	HE, OF-350			Variation, of							Range	Height	RANGE			
				W-R	Without the cap	With the cap	Air temp. $\Delta t^{\circ} = 10^{\circ}\text{C}$	Air pressure $\Delta H = 10\text{mm}$	Muzzle velocity $V_0 = 10\text{m/sec}$	Temp. of pow- der $\Delta t_p = 10^{\circ}\text{C}$	Weight of pro- jectile for 2 signs	W							
mil			meter														meter		m
17	18	19	21	22	22a	23	24	25	26	27	33	34	1						
-6	5	3	26			16	4	220	18	+24			2600						
-7	5	3	28			17	5	228	19	+25			2700						
-7	6	4	30			17	5	236	19	+25			2800						
-7	6	4	32			18	5	244	20	+26			2900						
-8	6	4	34			18	6	252	21	+26			3000						
-8	6	4	36			19	6	260	21	+27			3100						
-9	6	4	39			20	6	267	22	+27			3200						
-9	7	5	42			21	7	274	23	+28			3300						
-10	7	5	45			22	7	281	23	+28			3400						
-11	7	5	48			22	8	288	24	+28			3500						
-11	8	5	52			23	8	295	24	+28			3600						
-12	8	6	56			24	9	301	25	+29			3700						
-13	8	6	61			25	9	307	26	+29			3800						
-14	9	6	67			26	10	313	26	+29			3900						
-15	9	7	74			27	10	319	27	+29			4000						
-18	10	8	80			28	11	324	28	+29			4080						

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr
		Stripe	Mil						Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	eph	F
1	1a	2	3	4	6	7	8	9	11	12	13	16
HIGH-ANGLE FIRE												
4000	4374		888	49°57'	1267	32.1	181	967	40	4.5		78
3900	4265		937	52 43	1369	33.4	183	1017	40	5.0		
3800	4156		973	54 44	1448	34.3	184	1056	40	5.3		
3700	4046		1004	56 28	1515	35.1	185	1087	40	5.5		
3600	3937		1032	58 02	1576	35.8	186	1115	40	5.7		41
3500	3828		1058	59 29	1632	36.4	187	1140	40	5.9		
3400	3718		1082	60 50	1682	37.0	188	1163	39	6.0		
3300	3609		1104	62 05	1730	37.5	188	1184	39	6.1		
3200	3500		1124	63 15	1777	37.9	189	1205	39	6.2		
3100	3390		1145	64 22	1817	38.3	190	1225	38	6.3		32
3040	3325		1156	65 00	1837	38.5	190	1237	38	6.3		32

Charge 1
 $V_0 = 222 \text{ m/s}$

CORRECTIONS												
Deflection, due to			RANGE, DUE TO									
Drift	Lateral wind of 10 m/sec	Cant of carriage axle of 10 mil	HE, OF-350			Variation, of						
			Rear wind of 10 m/sec	Without the cap	With the cap	Air temp. $\Delta t = 10^\circ\text{C}$	Air pressure $\Delta H = 10 \text{ mm}$	Muzzle velocity $V_0 = 10 \text{ m/sec}$	Temp. of pow. der $\Delta T_p = 10^\circ\text{C}$	Weight of projectile for 2 signs	Range Change in elevation of 1 mil displaces	RANGE
Dlt	W-D	Cant	W-R	on fuze KTM-1		t	H	MV	t _p	W	Range	Height
mil											meter	m
17	18	19	21	22	22a	23	24	25	26	27	33	34
HIGH-ANGLE FIRE												
-21	11	11	83			28	11	304	27	+27	2	4000
-23	13	13	86			29	10	281	25	+24		3900
-24	14	14	89			29	10	262	24	+22		3800
-25	14	15	91			29	10	247	22	+21		3700
-26	15	16	93			29	10	234	21	+20	4	3600
						29	10	222	20	+19		3500
-27	15	17	95			28	10	211	19	+17		3400
-27	16	18	96			28	10	202	18	+16		3300
-28	16	19	97			28	10	193	17	+15		3200
-29	16	20	98			28	9	185	17	+15	5	3100
-29	16	20	98									
-30	16	21	98				9	180	16	+14	5	3040

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr
		Stripe	Mill						Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	eph	mil
1	1a	2	3	4	5	6	7	8	9	10	11	12
2600	2843	67	180	10°09'	123	10,0	243	202	19	2,0	3,7	
2700	2953	70	189	10 37	134	10,4	241	212	19	2,1	4,0	
2800	3062	72	197	11 05	146	10,9	240	222	20	2,1	4,4	
2900	3171	75	205	11 33	158	11,3	239	232	20	2,2	4,7	
3000	3281	77	214	12 02	171	11,8	237	243	21	2,2	5,1	7
3100	3390	80	223	12 32	185	12,2	236	253	21	2,3	5,4	
3200	3500	82	232	13 02	200	12,7	234	264	22	2,3	5,8	
3300	3609	84	241	13 33	215	13,1	233	275	22	2,4	6,3	
3400	3718	87	250	14 04	230	13,6	232	286	23	2,4	6,7	
3500	3828	89	259	14 35	246	14,1	231	298	24	2,5	7,2	9
3600	3937	91	269	15 07	262	14,6	229	310	24	2,5	7,7	
3700	4046	93	278	15 39	280	15,1	228	322	25	2,6	8,2	
3800	4156	96	288	16 12	300	15,6	227	335	26	2,6	8,7	
3900	4265	98	298	16 45	321	16,1	226	348	26	2,7	9,2	
4000	4374	100	308	17 19	343	16,7	225	361	27	2,7	9,8	11
4100	4484	103	319	17 55	366	17,2	224	374	28	2,8	10	
4200	4593	105	330	18 33	386	17,8	223	388	29	2,8	11	
4300	4702	107	341	19 12	410	18,3	222	402	30	2,9	12	
4400	4812	110	353	19 52	435	18,9	221	417	31	2,9	13	
4500	4921	112	365	20 32	462	19,4	220	432	31	3,0	13	15
4600	5031	115	377	21 13	490	20,0	219	447	32	3,0	14	
4700	5140	117	390	21 55	520	20,6	218	463	33	3,0	15	
4800	5249	120	403	22 39	551	21,2	218	479	34	3,1	16	
4900	5359	122	416	23 24	584	21,8	217	496	35	3,1	17	
5000	5468	125	430	24 09	619	22,5	216	513	36	3,1	18	20

Charge 2
V₀ = 288 m/s

CORRECTIONS												
Deflection, due to		RANGE, DUE TO										
		HE, OF-350					Variation, of					
Dirt	Lateral wind of 10 m/sec	Wind of 10 m/sec	Without the cap	With the cap	Air temp. Δ t = 10°C	Air pressure Δ H = 10 mm	Muzzle velocity V ₀ = 10 m/sec	Temp. of powder Δ t _p = 10°C	Weight of projectile for 2 signs	Range	Height	RANGE
mil	W-D	W-R	on fuze KTM-1		t	H	MV	t _p	W	meter	meter	m
17	18	19	21	22	22a	23	24	25	26	27	33	34
-5	3	2	37	-7		24	4	139	16	+24		2600
-6	3	2	39	-7		25	4	143	17	+24		2700
-6	3	2	41	-8		26	5	148	17	+25		2800
-6	4	2	43	-9		27	5	152	18	+25		2900
-7	4	2	46	-10		28	5	157	18	+25	12	2,9
-7	4	2	48	-11		29	5	161	19	+26		3100
-7	4	2	50	-12		30	6	166	19	+26		3200
-8	4	2	53	-13		31	6	170	20	+27		3300
-8	4	3	55	-14		32	6	174	20	+27		3400
-8	4	3	58	-15		33	7	179	21	+27	11	3,1
-9	4	3	61	-17		34	7	183	22	+28		3600
-9	4	3	63	-18		35	7	187	22	+28		3700
-9	5	3	66	-20		36	8	191	23	+28		3800
-10	5	3	69	-22		37	8	196	23	+29		3900
-10	5	3	72	-24		38	8	200	24	+29	10	3,5
-10	5	3	75	-26		39	9	204	24	+29		4100
-11	5	4	78	-28		40	9	208	24	+29		4200
-11	5	4	82	-30		41	10	212	25	+30		4300
-11	5	4	85	-33		42	10	216	25	+30		4400
-12	6	4	88	-36		43	11	220	26	+30	9	3,8
-12	6	4	92	-39		44	11	224	26	+30		4600
-12	6	4	95	-42		45	11	228	27	+30		4700
-13	6	5	99	-45		46	12	232	27	+31		4800
-13	6	5	102	-48		47	12	236	28	+31		4900
-13	7	5	106	-51		48	13	240	28	+31	7	3,9
						49						5000

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr
		Stripe	Mil						Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	eph	F
1	1a	2	3	4	6	7	8	9	11	12	13	16
5100	5577	127	444	24°58'	658	23.1	216	532	37	3.1	21	27
5200	5687	130	459	25 48	698	23.8	215	550	38	3.2	22	
5300	5796	132	475	26 42	742	24.5	215	570	39	3.2	24	
5400	5905	134	492	27 39	788	25.3	214	591	40	3.2	25	
5500	6015	137	510	28 42	840	26.1	214	613	41	3.3	27	
5600	6124	139	530	29 50	900	27.0	213	638	42	3.4	29	63
5700	6234	142	553	31 07	966	28.0	213	665	43	3.5	31	
5800	6343	145	579	32 34	1044	29.1	213	694	45	3.6	34	
5900	6452	147	609	34 16	1137	30.4	213	728	46	3.7	37	
6000	6562	150	648	36 26	1245	31.9	213	770	47	3.8	40	
6100	6671	154	704	39 35	1355	34.0	214	823	48	4.0	46	103
6145	6720	155	800	45 00	1748	46.6	215	930	49	4.4	56	

Charge 2
V₀ = 288 m/s

CORRECTIONS														
Deflection, due to			RANGE, DUE TO											
Drift	Lateral wind of 10 m/sec	Cap. of carriage axis of 10 mil	HE, OF-350			Variation, of							Change in elevation of 1 mil displaces	
			Without the cap	With the cap	on fuze KTM-1	Air temp Δt = 10°C	Air pressure ΔH = 10 mm	Muzzle velocity V ₀ = 10 m/sec	Temp. of powder Δt _p = 10°C	Weight of projectile for 2 signs	W	Range	Height	RANGE
DR	W-D	Cap	W-R	on fuze KTM-1	W-R	t ₂	H	MV	t _{2p}	W	W	meter	meter	m
mil	mil	mil	mil	mil	mil	mil	mil	mil	mil	mil	mil	meter	meter	m
17	18	19	21	22	22a	23	24	25	26	27	33	34	1	
-14	7	5	110	-54		55	14	244	29	+31				5100
-14	7	6	114	-57		57	14	248	29	+31				5200
-14	7	6	118	-60		58	15	252	30	+31				5300
-15	8	6	122	-64		60	16	256	30	+31				5400
-15	8	7	127	-68		62	16	260	31	+31	6	3.8		5500
-16	8	7	132	-72		64	17	264	31	+31				5600
-16	9	7	137	-77		66	18	268	32	+31				5700
-17	9	8	142	-82		68	19	272	32	+31				5800
-18	9	8	148	-87		70	20	277	32	+31				5900
-18	10	8	154	-93		72	20	281	33	+31				6000
-20	10	9	161	-98		75	21	285	33	+31				6100
-22	11	9	167	-98		77	22	286	34	+30	2	1.3		6145

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr
m	yd	st	mil						Range	Deflection	Height	
1	1a	2	3	4	5	6	7	8	9	10	11	12
1	1a	2	3	4	5	6	7	8	9	10	11	12
HIGH ANGLE FIRE												
6100	6671		848	47°42'	1907	39.3	217	970	52	5.7		70
6000	6562		895	50 20	2053	40.9	218	1018	53	6.3		
5900	6452		927	52 09	2153	41.9	219	1049	53	6.7		
5800	6343		954	53 40	2234	42.8	220	1073	53	7.0		
5700	6234		978	55 00	2303	43.5	221	1095	52	7.2		
5600	6124		1001	56 18	2365	44.1	222	1113	52	7.4		38
5500	6015		1022	57 28	2422	44.6	223	1131	51	7.6		
5400	5901		1041	58 35	2473	45.1	223	1147	50	7.8		
5300	5796		1060	59 38	2522	45.6	224	1163	49	8.0		
5200	5687		1078	60 37	2567	46.1	225	1177	48	8.1		
5100	5577		1094	61 33	2610	46.5	225	1191	48	8.2		27
5000	5468		1110	62 27	2651	46.9	226	1203	47	8.3		
4900	5359		1125	63 18	2688	47.3	227	1215	47	8.4		
4800	5249		1140	64 09	2723	47.6	228	1226	46	8.6		
4700	5140		1156	65 00	2756	47.9	228	1237	45	8.8		23

Charge 2

V₀ = 288 m/s

CORRECTIONS												
Deflection, due to			RANGE, DUE TO									
Drift	Lateral wind of 10 m/sec	Cap of carriage axle of 10 mil	HE, OF-350		Variation, of							
			Without the cap	With the cap	Air temp $\Delta T = 10^\circ\text{C}$	Air pressure $\Delta H = 10\text{ mm}$	Muzzle velocity $V_0 = 10\text{ m/sec}$	Temp. of powder $\Delta T_p = 10^\circ\text{C}$	Weight of projectile for 2 signs	Change in elevation of 1 mil displaces		RANGE
DR	W-D	W-R	on fuze KTM-1		1°	H	MV	1°p	W	Range	Height	1
mil										meter	m	
17	18	19	21	22	22a	23	24	25	26	27	33	34
HIGH ANGLE FIRE												
-29	12	158	167	-108		73	22	281	34	+28	3	6100
-32	13	159	167	-106		72	22	274	33	+26		6000
-34	14	160	167	-100		69	22	268	32	+24		5900
-36	14	160	166	-90		67	22	263	31	+23		5800
-38	15	160	165	-80		66	21	259	31	+21		5700
-40	16	160	163	-70		65	21	254	30	+20	5	5600
-41	16	159	161	-60		64	21	250	29	+19		5500
-42	17	158	160	-50		62	20	246	28	+19		5400
-43	17	157	158	-39		6	20	242	28	+18		5300
-44	18	156	156	-30		6	19	238	27	+18		5200
-45	18	155	154	-22		6	19	234	27	+17	7	5100
-46	19	153	152	-14		58	18	231	26	+17		5000
-47	19	151	151	-6		57	18	228	26	+17		4900
-48	20	149	149			57	17	225	25	+16		4800
-49	21	147	147			55	16	222	25	+16	8	4700

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation		Maximum ordinate		Time of flight		Terminal velocity		Angle of fall		Probable error			Fork of 4 epr
m	yd	St	mil	deg	m	sec	m/sec	mil	Θ	epr	epd	eph	Θ	Range	Deflection	Height	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
100	109	2	4.7	0° 16'	0.3	0.3	339	5	14	0.1	0.1						
200	219	4	9.5	0 32	0.6	0.6	336	10	14	0.2	0.1						
300	328	6	14.2	0 48	1.0	0.9	333	15	14	0.2	0.2						
400	437	8	19.0	1 04	2.1	1.2	329	20	14	0.3	0.3						
500	547	10	23.7	1 20	4.3	1.5	326	25	14	0.3	0.4						2
600	656	12	28.4	1 36	6.7	1.8	323	31	14	0.4	0.4						
700	766	14	33.2	1 52	9.2	2.2	320	36	14	0.4	0.5						
800	875	16	37.9	2 08	11	2.5	317	42	14	0.5	0.6						
900	984	18	42.7	2 24	13	2.8	313	47	14	0.6	0.6						
1000	1094	20	47.4	2 40	15	3.1	310	53	14	0.6	0.7						2
1100	1203	22	52.4	2 57	17	3.5	307	58	14	0.7	0.8						
1200	1312	24	57.2	3 13	19	3.8	304	64	14	0.7	0.9						
1300	1422	26	62.2	3 30	23	4.1	301	70	14	0.8	1.0						
1400	1531	28	67.3	3 47	27	4.5	298	76	14	0.8	1.0						
1500	1640	30	72.3	4 04	31	4.8	296	82	14	0.9	1.1						3
1600	1750	32	77.3	4 21	35	5.2	293	88	14	1.0	1.2						
1700	1859	34	82.7	4 39	39	5.5	290	94	14	1.0	1.3						
1800	1968	36	88.0	4 57	44	5.9	288	101	14	1.1	1.4						
1900	2079	38	93.3	5 15	49	6.2	286	107	15	1.2	1.6						
2000	2187	40	98.7	5 33	54	6.5	284	113	15	1.2	1.7						3
2100	2297	42	104	5 51	59	6.9	281	120	15	1.3	1.8						
2200	2406	44	109	6 09	64	7.2	279	127	15	1.4	1.9						
2300	2515	46	115	6 28	70	7.6	277	133	15	1.5	2.0						
2400	2625	48	121	6 47	76	7.9	276	140	16	1.6	2.2						
2500	2734	50	126	7 06	83	8.3	274	147	16	1.6	2.3						3

Charge 3

V₀ = 343 m/s

CORRECTIONS																
Deflection, due to			RANGE, DUE TO													
Drift	Lateral wind of 10 m/sec	Cant of carriage axle of 10 mil	Rear wind of 10 m/sec	HE, OF-350		Variation, of							Change in elevation of 1 mil displaces		RANGE	
				Without the cap	With the cap	Air temp. Δ t = 10°C	Air pressure Δ H = 10 mm	Muzzle velocity V ₀ = 10 m/sec	Temper. of powder Δ t _p = 10°C	Weight of projectile for 2 signs						
Dft	W-D		W-R	on fuze	KTM-1	°	H	MV	t ^p	W	Range	Height	meter	m		
m i l			m e t e r													
17	18	19	21	22	22a	23	24	25	26	27	33	34		1		
	2		1	2		1		7	1	+	1			100		
	2		2	3		2		12	2	+	2			200		
	2		3	4		3		17	2	+	3			300		
	2		4	5	— 1	4		22	3	+	2			400		
	2		5		— 1	5	1	27	4	+	3	21	0,5	500		
	2			7	— 2	6	1	32	4	+	3			600		
	2			8	— 2	7		37	5	+	4			700		
	2			9	— 3	8	1	41	6	+	5			800		
	2		11	10	— 3	9	1	46	6	+	5			900		
	2		13	— 4		10	2	50	7	+	6	20	1,0	1000		
	3	1	14	— 5	—	1	2	55	8	+	6			1100		
	3	1	16	— 6	—	2	2	59	8	+	7			1200		
	3	1	17	— 7	— 1	1	2	63	9	+	7			1300		
	3	1	19	— 8	— 2	2	2	67	10	+	8			1400		
	3	1	21	— 9	— 2	3	3	71	10	+	9	20	1,6	1500		
	3	1	23	— 10	— 2	1	3	75	11	+	9			1600		
	3	1	24	— 11	— 3	3	3	79	11	+	10			1700		
	3	1	26	— 13	— 4	18	3	83	12	+	10			1800		
	3	1	28	— 14	— 5	19	4	86	12	+	11			1900		
	3	1	30	— 16	— 6	20	4	90	13	+	12	19	2,0	2000		
	3	1	32	— 17	— 7	22	4	93	13	+	12			2100		
	3	1	34	— 19	— 8	23	4	97	14	+	13			2200		
	3	1	37	— 21	— 9	24	4	100	14	+	13			2300		
	3	1	39	— 23	— 10	25	5	103	15	+	14			2400		
	4	1	41	— 25	— 11	27	5	106	15	+	15	18	2,6	2500		

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation		Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Foot of 4 epr
		Stripe	Mill			Ys	TE	V ₀	Θ	Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil		epr	epd	eph	F
1	2	3	4	5	6	7	8	9	10	11	12	13	14
2500	2843	52	132	7°26'	90	8.6	273	154	16	1.7	2.5		
2700	2923	54	138	7 46	98	9.0	271	162	16	1.8	2.6		
2800	3062	56	144	8 06	106	9.4	269	170	16	1.9	2.8		
2900	3171	58	150	8 27	115	9.8	268	178	17	2.0	2.9		
3000	3281	60	156	8 48	125	10.2	267	186	17	2.1	3.1		4
3100	3390	62	163	9 09	135	10.5	265	194	17	2.2	3.3		
3200	3500	64	169	9 30	145	10.9	264	202	18	2.3	3.6		
3300	3609	66	175	9 52	155	11.3	263	211	18	2.3	3.8		
3400	3718	68	182	10 14	167	11.7	261	219	18	2.4	4.0		
3500	3828	70	189	10 37	179	12.1	260	228	19	2.5	4.3		5
3600	3937	72	196	11 00	190	12.5	259	236	19	2.6	4.6		
3700	4046	74	203	11 24	203	13.0	258	245	19	2.6	4.8		
3800	4156	76	210	11 48	216	13.3	256	254	20	2.7	5.1		
3900	4265	78	217	12 13	230	13.7	255	263	20	2.8	5.4		
4000	4374	80	225	12 38	244	14.1	254	272	20	2.9	5.7		6
4100	4484	82	232	13 04	258	14.5	253	281	21	3.0	6.1		
4200	4593	84	240	13 30	273	15.0	252	290	21	3.1	6.4		
4300	4702	86	248	13 57	296	15.5	251	300	22	3.1	6.7		
4400	4812	88	256	14 24	314	15.9	250	311	22	3.2	7.1		
4500	4921	90	264	14 51	332	16.4	249	322	23	3.3	7.4		7
4600	5031	92	272	15 18	352	16.9	248	333	23	3.4	7.8		
4700	5140	94	280	15 46	372	17.3	247	344	24	3.5	8.2		
4800	5249	96	289	16 15	393	17.8	246	355	24	3.5	8.6		
4900	5359	98	298	16 45	414	18.3	245	366	25	3.6	9.1		
5000	5468	100	307	17 15	437	18.8	244	377	25	3.6	9.4		8

Charge 3
V₀ = 343 m/s

CORRECTIONS													
Deflection, due to			RANGE, DUE TO										
Drift	Lateral wind of 10 m/sec	Can't of carriage axle of 10 mil	HE, OF-350			Variation, of							
			Without the cap	With the cap	Air temp Δ t = 10°C	Air pressure Δ H = 10 mm	Muzzle velocity V ₀ = 10 m/sec	Temp. of pow. der Δ t p = 10°C	Weight of projectile for 2 signs	Change in elevation of 1 mil displaces			
Dft	W-D	W-R	W-R	on fuze KTM-1	°	H	MV	°p	W	Range	Height	RANGE	
mil										meter	m		
17	18	19	21	22	22a	23	24	25	26	27	33	34	1
-4	4	1	43	-28	-12	28	5	109	16	+16			2600
-5	4	1	46	-30	-13	29	5	112	16	+16			2700
-5	4	1	48	-32	-15	31	6	115	17	+17			2800
-5	4	2	51	-34	-17	32	6	118	17	+18			2900
-6	4	2	53	-36	-19	34	6	121	17	+19	15	2.8	3000
-6	4	2	56	-38	-21	35	7	124	18	+19			3100
-6	4	2	59	-40	-23	37	7	127	18	+20			3200
-7	4	2	62	-43	-25	38	7	129	19	+20			3300
-7	5	2	64	-46	-27	40	7	132	19	+21			3400
-7	5	2	67	-49	-29	42	8	135	20	+22	14	3.4	3500
-8	5	2	70	-52	-31	43	8	138	20	+22			3600
-8	5	2	73	-55	-33	45	8	140	21	+23			3700
-8	5	2	76	-58	-35	47	9	143	21	+23			3800
-9	5	2	79	-61	-37	49	9	146	21	+24			3900
-9	5	2	82	-64	-38	50	10	148	21	+24	13	3.5	4000
-9	5	2	85	-67	-40	52	10	151	22	+25			4100
-9	5	2	89	-70	-42	54	10	153	22	+25			4200
-10	6	3	92	-73	-44	56	11	156	23	+25			4300
-10	6	3	95	-76	-45	58	11	159	23	+26			4400
-10	6	3	99	-79	-47	60	12	161	23	+26	12	3.8	4500
-11	6	3	102	-82	-49	62	12	164	24	+26			4600
-11	6	3	106	-85	-51	64	12	166	24	+26			4700
-11	6	3	109	-88	-52	65	13	169	25	+26			4800
-12	6	3	113	-91	-54	67	13	172	25	+27			4900
-12	6	3	116	-94	-55	69	14	174	26	+27	12	4.5	5000

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Wind of 4 mps
		Stripe	Mill						Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	eph	m
1	1a	2	3	4	5	6	7	8	9	10	11	12
5100	5577	102	316	17°45'	460	19.3	243	389	26	3.7	10	
5200	5687	104	325	18 16	484	19.8	242	401	26	3.8	10	
5300	5796	106	334	18 48	509	20.3	241	413	27	3.9	11	
5400	5905	108	343	19 20	536	20.8	240	425	28	3.9	11	
5500	6015	110	353	19 52	563	21.4	239	437	28	4.0	12	10
5600	6124	112	363	20 25	591	21.9	239	450	29	4.1	13	
5700	6234	114	373	20 58	620	22.4	238	463	30	4.1	14	
5800	6343	116	383	21 32	651	23.0	237	476	31	4.2	15	
5900	6452	118	393	22 07	683	23.5	237	489	32	4.3	16	
6000	6562	120	404	22 44	717	24.1	236	502	32	4.3	17	13
6100	6671	122	415	23 21	751	24.7	236	516	33	4.4	18	
6200	6780	124	426	23 58	789	25.3	235	530	34	4.5	19	
6300	6890	126	438	24 37	828	25.9	234	546	35	4.5	20	
6400	6999	128	450	25 18	869	26.5	234	562	36	4.6	21	
6500	7108	130	462	26 00	913	27.1	234	576	37	4.7	22	16
6600	7218	132	475	26 45	959	27.8	233	592	38	4.8	23	
6700	7327	134	489	27 32	1008	28.5	233	608	39	4.9	25	
6800	7436	136	504	28 21	1060	29.3	233	627	40	4.9	27	
6900	7546	138	519	29 12	1118	30.0	233	646	41	5.0	28	
7000	7655	140	536	30 09	1180	30.8	233	665	42	5.1	30	22
7100	7765	142	554	31 08	1248	31.7	233	686	43	5.1	32	
7200	7874	144	573	32 13	1324	32.6	233	708	44	5.2	34	
7300	7983	146	595	33 27	1408	33.7	233	734	45	5.3	36	
7400	8093	148	619	34 50	1504	34.9	233	762	46	5.4	39	
7500	8202	150	649	36 30	1620	36.2	234	793	47	5.6	42	45

Charge 3

V₀ = 343 m/s

CORRECTIONS												
Deflection, due to			RANGE, DUE TO									
Drift	Lateral wind of 10 m/sec	Can of carriage axle of 10 mil	HE, OF-350		Variation, of							
			Without the cap	With the cap	Air temp. Δ t = 10°C	Air pressure Δ H = 10 mm	Muzzle velocity V ₀ = 10 m/sec	Temp. of powder Δ t p = 10°C	Weight of projectile for 2 signs	Change in elevation of 1 mil displaces		RANGE
DR	W-D	Can of carriage axle of 10 mil	W-R	on fuze KTM-1	t	H	MV	t _p	W	Range	Height	RANGE
mil										meter	m	m
17	18	19	21	22	22a	23	24	25	26	27	33	34
-12	7	3	120	-97	-57	71	14	177	26	+27		5100
-13	7	3	124	-100	-58	73	15	179	26	+27		5200
-13	7	3	127	-103	-59	75	15	182	26	+27		5300
-14	7	4	131	-106	-61	77	16	185	27	+27		5400
-14	7	4	135	-109	-62	80	16	187	27	+26	10	4,4
-14	8	4	139	-112	-63	82	17	190	27	+26		5600
-14	8	4	143	-115	-64	84	17	192	28	+26		5700
-14	8	4	147	-118	-65	86	18	195	29	+26		5800
-15	8	4	151	-122	-66	88	18	198	29	+26		5900
-15	8	4	155	-125	-67	90	19	200	30	+26	9,7	5,0
-15	8	4	159	-128	-68	92	20	203	30	+25		6100
-15	8	5	164	-132	-69	94	20	205	30	+25		6200
-15	8	5	168	-135	-70	96	21	208	31	+25		6300
-15	8	5	172	-138	-70	98	21	210	31	+25		6400
-16	8	5	177	-142	-70	100	22	213	32	+25	8,4	5,0
-16	9	5	181	-145	-71	102	23	216	32	+24		6600
-17	9	5	186	-148	-71	104	23	218	32	+24		6700
-17	9	6	191	-151	-71	106	24	221	33	+24		6800
-17	9	6	196	-154	-72	108	25	223	33	+24		6900
-18	10	6	200	-157	-72	110	25	226	33	+24	6,6	4,7
-18	10	6	205	-160	-72	112	26	228	34	+23		7100
-19	10	7	210	-163	-72	115	27	231	34	+23		7200
-20	11	7	215	-166	-72	117	28	233	34	+23		7300
-21	11	7	220	-169	-72	119	29	235	34	+22		7400
-22	12	8	226	-172	-73	121	29	238	35	+22	4,5	3,9

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation		Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr
		Stripe	Mil			Ys	TF	V _T	Θ	Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil		epr	epd	eph	F
1	2	3	4	5	6	7	8	9	10	11	12	13	14
7600	8311	152	687	38°36'	1761	37.8	235	832	48	5.8	46		
7700	8421	154	739	41 33	1974	39.9	236	885	50	6.2	52		
7740	8465	154.8	800	45 00	2240	41.6	238	948	51	7.0	65		
HIGH ANGLE FIRE													
7700	8421		846	47°10'	2410	44.3	241	990	54	7.5			48
7600	8311		883	49 42	2585	45.9	242	1028	55	8.4			
7500	8202		915	51 27	2710	46.9	243	1054	55	9.0			
7400	8093		939	52 50	2805	47.8	244	1075	55	9.3			
7300	7983		960	54 00	2880	48.5	245	1094	54	9.6			
7200	7874		979	55 04	2941	49.1	246	1110	54	9.8			
7100	7765		997	56 03	3028	49.6	247	1125	54	10			30
7000	7755		1013	56 57	3089		247	1138	53	10			
6900	7546		1028	57 46	3146		248	1150	52	10			
6800	7436		1042	58 36	3200		248	1162	52	11			
6700	7327		1056	59 22	3254		249	1173	51	11			
6600	7218		1069	60 08	3297	51.7	249	1184	51	11			
6500	7108		1082	60 52	3342	52.1	249	1194	50	11			24
6400	6999		1095	61 36	3385	52.5	250	1204	49	11			
6300	6890		1108	62 20	3425	52.8	250	1214	49	11			
6200	6780		1121	63 03	3463	53.1	250	1223	48	11			
6100	6671		1134	63 47	3500	53.4	251	1232	47	11			22
6000	6562		1147	64 32	3535	53.7	251	1241	47	11			
5900	6456		1156	65 00	3545	53.9	252	1248	46	11			22

Charge 3

V₀ = 343 m/s

CORRECTIONS													
Deflection, due to				RANGE, DUE TO									
Drift	Lateral wind of 10 m/sec	Cent of carriage axle of 10 mil	Rear wind of 10 m/sec	HE, OF-350		Variation, of							Change in elevation of 1 mil displaces
				Without the cap	With the cap	Air temp. Δ t = 10°C	Air pressure Δ H = 10 mm	Muzzle velocity V ₀ = 10 m/sec	Temp. of powder Δ t _p = 10°C	Weight of projectile for 2 signs	Range	Height	
DH	W-D		W-R	on fuze KTM-1		°	H	MV	°p	W			RANGE
m	il										m	m	
17	18	19	21	22	22a	23	24	25	26	27	33	34	1
-24	12	8	232	-176	-74	123	30	240	35	+21			7600
-27	13	8	238	-180	-75	125	31	241	35	+20			7700
-32	13	9	243	-180	-75	126	32	242	35	+20	1.4	1.7	7740
HIGH ANGLE FIRE													
-35	13	10	243	-180	-75	123	32	236	35	+18			7700
-40	14	11	241	-180	-75	119	32	230	35	+16	5		7600
-44	15	12	240	-180	-75	116	32	225	34	+14			7500
-47	16	13	238	-180	-75	113	31	221	34	+13			7400
-50	16	14	236	-180	-76	110	31	218	33	+13			7300
-52	17	15	235	-180	-76	110	31	215	33	+12			7200
-54	17	16	233	-180	-77	108	31	213	32	+12	7		7100
-55	17	16	231	-180	-77	107	30	211	32	+12			7000
-56	18	17	229	-180	-78	105	29	209	31	+12			6900
-57	18	17	227	-180	-79	104	29	207	31	+12			6800
-58	18	18	226	-180	-80	103	29	206	31	+12			6700
-59	18	18	224	-178	-80	101	28	204	30	+12	8		6600
-60	19	19	221	-175	-79	99	28	202	30	+12			6500
-61	19	19	219	-170	-77	98	27	201	30	+12			6400
-62	19	19	217	-165	-75	97	27	199	29	+12			6300
-62	19	20	215	-155	-70	96	26	198	29	+12			6200
-63	20	20	213	-145	-65	95	26	197	29	+12	9		6100
-63	20	21	211	-135	-58	94	25	126	29	+12			6000
-63	21	21	209	-125	-50	93	24	125	29	+12	9		5900

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr
		Stripe	Mill						Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	eph	F
1	1a	2	3	4	5	6	7	8	9	10	11	12
100	109	1,5	3,6	0°12'	0,1	0,3	392	4	14	0,1		
200	219	3,0	7,2	0 24	0,3	0,6	387	8	14	0,2	0,1	
300	328	4,6	11,0	0 37	0,8	0,9	381	12	14	0,2	0,1	
400	437	6,2	14,6	0 50	1,4	1,1	376	17	14	0,3	0,2	
500	547	7,7	18,3	1 02	2,4	1,4	371	21	14	0,3	0,3	2
600	656	9,3	22,1	1 15	3,5	1,7	365	26	14	0,3	0,3	
700	766	11	26,0	1 28	4,7	2,0	360	30	14	0,4	0,4	
800	875	13	29,9	1 41	6,7	2,3	355	35	14	0,4	0,4	
900	984	14	33,8	1 54	9,3	2,6	350	39	14	0,4	0,5	
1000	1094	16	37,7	2 07	12	2,9	345	44	14	0,5	0,6	2
1100	1203	18	41,7	2 21	14	3,2	341	49	14	0,5	0,6	
1200	1312	19	45,7	2 34	17	3,5	336	53	14	0,6	0,7	
1300	1422	21	49,8	2 48	21	3,8	331	58	14	0,6	0,8	
1400	1531	23	53,9	2 02	24	4,1	327	63	14	0,7	0,9	
1500	1640	24	58,0	3 16	24	4,4	321	68	14	0,7	0,9	2
1600	1750	26	62,2	3 30	27	4,7	317	74	14	0,8	1,0	
1700	1859	28	66,6	3 45	31	5,0	313	79	14	0,8	1,1	
1800	1968	30	71,0	4 00	35	5,3	309	85	14	0,9	1,2	
1900	2079	31	75,5	4 15	39	5,6	306	91	14	1,0	1,2	
2000	2187	33	80,0	4 30	43	5,9	302	97	14	1,0	1,3	2
2100	2297	35	84,7	4 46	48	6,3	299	103	14	1,1	1,4	
2200	2406	37	89,7	5 03	54	6,6	296	110	14	1,1	1,5	
2300	2515	39	94,8	5 20	60	7,0	293	116	14	1,2	1,6	
2400	2625	40	100	5 38	66	7,3	290	123	14	1,2	1,7	
2500	2734	42	105	5 54	72	7,6	287	130	14	1,3	1,8	3

Charge 4
V₀ = 398 m/s

CORRECTIONS												
Deflection, due to			RANGE, DUE TO									
Drift	Lateral wind of 10 m/sec	Cent of carriage axle of 10 mil	HE, OF-350		Variation, of							
			Without the cap	With the cap	Air temp. Δ t = 10°C	Air pressure Δ H = 10 mm	Muzzle velocity V ₀ = 10 m/sec	Temp. of powder Δ t _{pow} = 10°C	Weight of projectile for 2 signs	Range	Change in elevation of 1 mil displaces	RANGE
Dft	W-D	W-R	W-R on fuze KTM-1	W-R	t°	H	MV	t _{sp}	W	meter	Height	m
17	18	19	21	22	22a	23	24	25	26	27	33	34
4	4	4	1			1		3				100
4	4	4	3			2		7				200
4	4	4	4	-1		3		11	2			300
4	4	4	6	-1		4	1	15	2			400
4	4	4	8	-2		5	1	18	3			500
										26	0,5	
4	4	4	9	-2		6	1	22	3			600
4	4	4	11	-3		8	1	25	4			700
4	4	4	13	-4	-1	9	1	28	4			800
4	4	4	14	-5	-1	10	2	31	5			900
4	4	4	16	-6	-2	11	2	34	5			1000
										25	1,1	
-1	4	4	18	-7	-2	12	2	37	6			1100
-1	4	4	19	-8	-3	13	3	40	6			1200
-1	5	1	21	-9	-3	15	3	43	7			1300
-1	5	1	23	-10	-4	16	3	46	7			1400
-1	5	1	25	-12	-5	18	4	49	8			1500
										25	1,7	
-1	5	1	27	-14	-6	19	4	52	8			1600
-1	5	1	29	-15	-7	21	4	55	9			1700
-1	5	1	31	-17	-8	22	4	58	9			1800
-1	5	1	34	-19	-10	23	5	60	10			1900
-2	5	1	36	-21	-11	25	5	63	10			2000
										23	2,2	
-2	5	1	38	-23	-12	27	5	66	11			2100
-2	5	1	41	-25	-14	28	6	68	11			2200
-2	6	1	43	-27	-15	30	6	71	12			2300
-2	6	1	46	-29	-16	32	6	73	12			2400
-2	6	1	49	-32	-18	33	7	76	12			2500

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr
		Stripe	Mil						Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	eph	m
1	1a	2	3	4	5	6	7	8	9	10	11	12
2600	2843	44	111	6°12'	78	8.0	285	137	14	1.3	1.9	
2700	2953	46	116	6 30	85	8.3	283	144	14	1.4	2.0	
2800	3062	48	121	6 48	92	8.7	281	150	14	1.5	2.1	
2900	3171	50	126	7 06	100	9.0	279	157	15	1.5	2.3	
3000	3281	52	131	7 25	108	9.4	277	165	15	1.6	2.4	3
3100	3390	54	137	7 44	116	9.8	275	172	15	1.6	2.6	
3200	3500	56	143	8 03	125	10.1	273	180	15	1.7	2.8	
3300	3609	58	149	8 22	135	10.5	271	187	15	1.8	2.9	
3400	3718	60	154	8 42	145	10.9	269	195	16	1.8	3.1	
3500	3828	61	160	9 01	156	11.3	268	203	16	1.9	3.2	4
3600	3937	63	166	9 21	167	1.6	267	211	16	1.9	3.4	
3700	4046	65	172	9 40	178	2.0	265	220	16	2.0	3.6	
3800	4156	67	178	10 01	190	2.4	264	228	16	2.0	3.8	
3900	4265	69	184	10 22	203	2.8	263	237	16	2.1	4.0	
4000	4374	71	191	10 43	217	3.2	261	246	17	2.1	4.2	4
4100	4484	72	197	11 04	231	3.6	260	254	17	2.2	4.4	
4200	4593	74	204	11 26	245	4.0	259	263	17	2.2	4.6	
4300	4702	76	210	11 48	260	4.4	258	272	17	2.3	4.8	
4400	4812	78	216	12 0	275	4.8	257	281	17	2.4	5.0	
4500	4921	80	223	12 33	291	5.2	256	290	18	2.4	5.2	5
4600	5031	81	230	12 56	308	5.6	255	299	18	2.5	5.4	
4700	5140	83	237	13 18	325	6.0	254	309	18	2.5	5.6	
4800	5249	85	243	13 41	342	6.5	253	319	18	2.6	5.9	
4900	5359	87	250	14 04	360	6.9	252	329	18	2.6	6.2	
5000	5468	88	257	14 28	380	7.3	251	339	19	2.7	6.4	5

Charge 4
V₀ = 398 m/s

CORRECTIONS																
Deflection, due to			RANGE, DUE TO													
Drift	Lateral wind of 10 m/sec	Cant of carriage axle of 10 mil	HE, OF-350		Variation, of											
			Without the cap	With the cap	Air temp. $\Delta t = 10^\circ\text{C}$	Air pressure $\Delta H = 10 \text{ mm}$	Muzzle velocity $V_0 = 10 \text{ m/sec}$	Temp. of powder $\Delta t_p = 10^\circ\text{C}$	Weight of projectile for 2	Change in elevation of 1 mil displaces		RANGE		RANGE		m
Dft	W-D	Cant	W-R	on fuze KTM-1	t°	H	MV	t_p°	W	Range	Height	meter	m	meter	m	
17	18	19	21	22	22a	23	24	25	26	27	33	34	1	2	3	4
-2	6	1	52	-34	-20	35	7	78	13	+14			2600			
-3	6	1	55	-37	-22	37	7	80	13	+14			2700			
-3	6	1	58	-39	-24	39	8	83	14	+14			2800			
-3	6	1	61	-42	-26	41	8	85	14	+14			2900			
-3	6	1	64	-45	-28	43	8	87	14	+14	18	2.9	3000			
-3	6	1	67	-47	-30	45	9	89	14	+14			3100			
-4	6	1	71	-50	-32	47	9	91	15	+14			3200			
-4	7	1	74	-53	-34	49	10	93	15	+14			3300			
-4	7	1	77	-56	-36	51	10	95	16	+14			3400			
-4	7	2	81	-59	-38	53	10	97	16	+14	16	3.2	3500			
-5	7	2	84	-62	-40	55	11	99	16	+13			3600			
-5	7	2	88	-65	-42	57	11	101	16	+13			3700			
-5	7	2	92	-68	-44	59	12	103	17	+13			3800			
-5	7	2	96	-72	-46	61	12	105	17	+13			3900			
-6	7	2	99	-75	-48	63	12	107	18	+13	14	3.5	4000			
-6	7	2	103	-78	-50	65	13	108	18	+13			4100			
-6	8	2	107	-82	-53	67	13	110	18	+13			4200			
-6	8	2	111	-85	-56	71	14	112	18	+12			4300			
-7	8	2	115	-88	-58	73	14	113	19	+12			4400			
-7	8	2	119	-92	-60	76	15	115	19	+12	14	4.1	4500			
-7	8	3	128	-95	-63	78	15	116	19	+12			4600			
-7	8	3	132	-98	-66	81	16	118	19	+12			4700			
-8	8	3	136	-102	-68	83	16	119	20	+12			4800			
-8	8	3	141	-106	-70	85	16	121	20	+11			4900			
-8	8	3	141	-110	-72	88	17	123	20	+11	14	4.8	5000			

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Fork of 4 epr	
		Stripe	Mil						Range	Deflection	Height		
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	epb	m	
1	1a	2	3	4	5	6	7	8	9	11	12	13	16
2600	2843	44	111	6°12'	78	8.0	285	137	14	1.3	1.9		
2700	2953	46	116	6 30	85	8.3	283	144	14	1.4	2.0		
2800	3062	48	121	6 48	92	8.7	281	150	14	1.5	2.1		
2900	3171	50	126	7 06	100	9.0	279	157	15	1.5	2.3		
3000	3281	52	131	7 25	108	9.4	277	165	15	1.6	2.4		3
3100	3390	54	137	7 44	116	9.8	275	172	15	1.6	2.6		
3200	3500	56	143	8 03	125	10.1	273	180	15	1.7	2.8		
3300	3609	58	149	8 22	135	10.5	271	187	15	1.8	2.9		
3400	3718	60	154	8 42	145	10.9	269	195	16	1.8	3.1		
3500	3828	61	160	9 01	156	11.3	268	203	16	1.9	3.2		4
3600	3937	63	166	9 21	167	11.6	267	211	16	1.9	3.4		
3700	4046	65	172	9 40	179	12.0	265	220	16	2.0	3.6		
3800	4156	67	178	10 01	190	12.4	264	228	16	2.0	3.8		
3900	4265	69	184	10 22	203	12.8	263	237	16	2.1	4.0		
4000	4374	71	191	10 43	217	13.2	261	246	17	2.1	4.2		4
4100	4484	72	197	11 04	231	13.6	260	254	17	2.2	4.4		
4200	4593	74	204	11 26	245	14.0	259	263	17	2.2	4.6		
4300	4702	76	210	11 48	260	14.4	258	272	17	2.3	4.8		
4400	4812	78	216	12 10	275	14.8	257	281	17	2.4	5.0		
4500	4921	80	223	12 33	291	15.2	256	290	18	2.4	5.2		5
4600	5031	81	230	12 56	308	15.6	255	299	18	2.5	5.4		
4700	5140	83	237	13 18	325	16.0	254	309	18	2.5	5.6		
4800	5249	85	243	13 41	342	16.5	253	319	18	2.6	5.9		
4900	5359	87	250	14 04	360	16.9	252	329	18	2.6	6.2		
5000	5468	88	257	14 28	380	17.3	251	339	19	2.7	6.4		5

Charge 4
V₀ = 398 m/s

CORRECTIONS																
Deflection, due to			RANGE, DUE TO													
Drift	Lateral wind of 10 m/sec	Cent of carriage axis of 10 mil	HE, OF-350		Variation, of											
			Without the cap	With the cap	Air temp. $\Delta t = 10^\circ\text{C}$	Air pressure $\Delta H = 10\text{ mm}$	Muzzle velocity $V_0 = 10\text{ m/sec}$	Temp. of powder $\Delta t_p = 10^\circ\text{C}$	Weight of projectile for 2	Change in elevation of 1 mil displaces		RANGE		RANGE		
Dft	W-D	Cent of carriage axis of 10 mil	W-R	on fuze KTM-1	t	H	MV	t _p	W	Range	Height	meter	m	meter	m	
mil																
17	18	19	21	22	22a	23	24	25	26	27	33	34	1			
-2	6	1	52	-34	-20	35	7	78	13	+14			2600			
-3	6	1	55	-37	-22	37	7	80	13	+14			2700			
-3	6	1	58	-39	-24	39	8	83	14	+14			2800			
-3	6	1	61	-42	-26	41	8	85	14	+14			2900			
-3	6	1	64	-45	-28	43	8	87	14	+14	18	2.9	3000			
-3	6	1	67	-47	-30	45	9	89	14	+14			3100			
-4	6	1	71	-50	-32	47	9	91	15	+14			3200			
-4	7	1	74	-53	-34	49	10	93	15	+14			3300			
-4	7	1	77	-56	-36	51	10	95	16	+14			3400			
-4	7	2	81	-59	-38	53	10	97	16	+14	16	3.2	3500			
-5	7	2	84	-62	-40	55	11	99	16	+13			3600			
-5	7	2	88	-65	-42	57	11	101	16	+13			3700			
-5	7	2	92	-68	-44	59	12	103	17	+13			3800			
-5	7	2	96	-72	-46	61	12	105	17	+13			3900			
-6	7	2	99	-75	-48	63	12	107	18	+13	14	3.5	4000			
-6	7	2	103	-78	-50	65	13	108	18	+13			4100			
-6	8	2	107	-82	-53	67	13	110	18	+13			4200			
-6	8	2	111	-85	-56	71	14	112	18	+12			4300			
-7	8	2	115	-88	-58	73	14	113	19	+12			4400			
-7	8	2	119	-92	-60	76	15	115	19	+12	14	4.1	4500			
-7	8	3	128	-95	-63	78	15	116	19	+12			4600			
-7	8	3	132	-98	-66	81	16	118	19	+12			4700			
-8	8	3	136	-102	-68	83	16	119	20	+12			4800			
-8	8	3	141	-106	-70	85	16	121	20	+11			4900			
-8	8	3	141	-110	-72	88	17	123	20	+11	14	4.8	5000			

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation	Maximum ordinate	Time of flight	Terminal velocity	Angle of fall	Probable error			Port of 4 epr
		Stripe	Mil						Range	Deflection	Height	
m	yd	st	mil	deg	m	sec	m/sec	mil	epr	epd	eph	P
1	2	3	4	5	6	7	8	9	11	12	13	16
5100	5577	90	265	14° 53'	400	17.8	250	349	19	2.8	6.6	
5200	5687	92	272	15 8	420	18.2	249	359	19	2.9	6.9	
5300	5796	94	280	15 43	440	18.7	248	369	20	2.9	7.2	
5400	5905	96	287	16 08	462	19.1	248	379	20	3.0	7.5	
5500	6015	97	294	16 34	485	19.6	247	389	20	3.0	7.8	6
5600	6124	99	302	17 00	507	20.0	246	399	20	3.1	8.2	
5700	6234	101	310	17 27	531	20.5	246	410	21	3.2	8.6	
5800	6343	103	318	17 54	556	21.0	245	421	21	3.3	9.0	
5900	6452	104	326	18 21	581	21.5	244	432	21	3.4	9.4	
6000	6562	106	335	18 50	608	22.0	244	443	22	3.5	9.8	7
6100	6671	108	344	19 20	636	22.5	243	454	22	3.6	10	
6200	6780	110	353	19 50	664	23.0	243	466	22	3.7	11	
6300	6890	112	362	20 20	694	23.5	242	478	23	3.8	11	
6400	6999	114	371	20 50	724	24.0	242	490	23	3.9	12	
6500	7108	115	379	21 21	757	24.5	241	502	24	4.0	12	8
6600	7218	117	388	21 52	790	25.1	241	514	24	4.1	13	
6700	7327	119	398	22 24	825	25.6	241	527	25	4.2	13	
6800	7436	121	408	22 57	860	26.2	240	540	25	4.3	14	
6900	7546	123	419	23 32	898	26.8	240	553	25	4.4	14	
7000	7655	125	430	24 09	936	27.4	240	567	26	4.5	15	10
7100	7765	126	440	24 45	977	28.0	239	581	26	4.6	16	
7200	7874	128	451	25 22	1021	28.6	239	595	27	4.7	17	
7300	7983	130	463	26 02	1066	29.3	239	610	28	4.8	18	
7400	8093	132	475	26 43	1114	29.9	239	625	29	4.9	19	
7500	8202	134	488	27 26	1165	30.6	239	640	30	5.0	20	14

Charge 4
V₀ = 398 m/s

CORRECTIONS															Range Change in elevation of 1 mil displaces Height	RANGE meter m						
Deflection, due to			RANGE, DUE TO																			
Drift	Lateral wind of 10 m/sec	Can't of carriage axis of 10 mil	HE, OF-350		Variation, of																	
			Without the cap	With the cap	Air temp. $\Delta t = 10^{\circ}\text{C}$	Air pressure $\Delta H = 10 \text{ mm}$	Muzzle velocity $V_0 = 10 \text{ m/sec}$	Temp. of pow- der, $\Delta t_p = 10^{\circ}\text{C}$	Weight of pro- jectile for 2													
										W-R	on fuze KTM-1	e	H	MV			t _p	W				
mil			meter												meter		m					
17	18	19	21	22	22a	23	24	25	26	27	33	34	1									
- 8	8	3	145	-114	-74	90	17	124	20	+11			5100									
- 8	9	3	150	-118	-76	93	18	125	20	+11			5200									
- 9	9	3	154	-122	-78	96	18	127	21	+11			5300									
- 9	9	3	159	-126	-80	98	19	128	21	+11			5400									
- 9	9	3	163	-130	-82	101	19	130	21	+10	13	5.2	5500									
-10	9	4	168	-134	-84	103	20	131	21	+10			5600									
-10	9	4	172	-138	-86	106	20	132	22	+10			5700									
-10	9	4	177	-141	-88	108	21	134	22	+10			5800									
-11	9	4	182	-145	-90	111	22	135	22	+10			5900									
-11	9	4	186	-149	-92	114	22	136	22	+9	12	5.6	6000									
-11	10	4	191	-153	-94	117	23	138	23	+9			6100									
-12	10	4	196	-157	-96	120	23	139	23	+9			6200									
-12	10	4	200	-161	-98	123	24	141	23	+9			6300									
-12	10	4	205	-165	-100	126	24	142	23	+8			6400									
-12	10	4	210	-169	-102	129	25	143	23	+8	11	6.0	6500									
-13	10	5	215	-173	-104	132	26	145	24	+7			6600									
-13	10	5	219	-177	-105	135	26	146	24	+7			6700									
-13	10	5	224	-181	-107	137	27	147	24	+7			6800									
-13	11	5	228	-185	-109	139	27	149	24	+6			6900									
-14	11	5	233	-189	-110	140	28	150	24	+6	9.0	5.6	7000									
-14	11	5	238	-193	-112	142	29	151	25	+6			7100									
-14	11	5	243	-197	-113	145	29	153	25	+5			7200									
-15	11	5	248	-201	-115	147	30	154	25	+5			7300									
-15	11	5	253	-205	-117	150	31	155	26	+4			7400									
-15	11	5	258	-209	-118	152	32	157	26	+4	7.7	5.6	7500									

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

Range		Range quadrant		Elevation		Maximum ordinate		Time of flight		Terminal velocity		Angle of fall		Probable error			Fork of 4 epr
m	yd	St	Mil	deg	m	sec	m/sec	mil	m/sec	mil	m/sec	mil	m/sec	Range	Deflection	Height	
1	1a	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
7600	8311	136	501	28°10'	1219	31.3	239	656	30	5.1	21						
7700	8421	137	515	28 57	1276	32.1	239	673	31	5.2	22						
7800	8530	139	530	29 45	1340	32.8	239	691	31	5.3	23						
7900	8639	141	545	30 40	1407	33.6	239	710	32	5.4	24						
8000	8749	143	562	31 37	1483	34.5	239	729	33	5.6	25						20
8100	8858	145	581	32 39	1567	35.4	239	751	34	5.8	27						
8200	8968	147	602	33 50	1661	36.5	240	775	35	6.0	29						
8300	9077	148	626	35 14	17 1	37.7	241	802	36	6.2	31						
8400	9186	150	655	36 52	1905	39.0	242	833	37	6.5	34						
8500	9296	152	694	39 02	2080	40	243	873	39	7.0	40						60
8600	9405	155	800	45 00	2500	46	248	977	42	8.2	48						
HIGH FIRE																	
8500	9296	8/1	49 00	2938	47	252	1042	46	9.2								
8400	9186	906	50 58	3100	50.0	254	1071	47	9.8								
8300	9077	932	52 27	3223	51.0	255	1093	48	10								
8200	8968	954	53 40	3323	51.8	256	1111	48	10								
8100	8858	975	54 50	3408	52.5	257	1127	48	11								40
8000	8749	993	55 50	3483	53.1	258	1141	48	11								
7900	8639	1009	56 44	3548	53.6	259	1153	48	11								
7800	8530	1024	57 36	3603	54.1	260	1165	48	11								
7700	8421	1038	58 24	3657	54.5	261	1176	47	11								
7600	8311	1051	59 08	3708	55.0	261	1187	47	12								25

Charge 4
 $V_0 = 398 \text{ m/s}$

CORRECTIONS																	
Deflection, due to			RANGE, DUE TO														
Drift	Lateral wind of 10 m/sec	Cant of carriage axis of 10 mil	HE, OF-350			Variation, of											
			Without the cap	With the cap	Air temp. $\Delta T = 10^\circ\text{C}$	Air pressure $\Delta H = 10 \text{ mm}$	Muzzle velocity $V_0 = 10 \text{ m/sec}$	Tangent of elevation $\Delta \theta = 10^\circ$	Weight of projectile for 2	Weight of projectile for 1	Weight of projectile for 0.5	Weight of projectile for 0.25	Weight of projectile for 0.125	Weight of projectile for 0.0625	Weight of projectile for 0.03125	Weight of projectile for 0.015625	Weight of projectile for 0.0078125
DR	W-D	Cant	W-R	on fuze KTM-1	θ	H	MV	θ	W	W	W	W	W	W	W	W	W
mil																	
17	18	19	21	22	22a	23	24	25	26	27	33	34	1				
-16	12	6	263	-213	-119	155	32	158	26	+3			7600				
-16	12	6	267	-217	-120	157	33	160	26	+3			7700				
-17	12	6	272	-221	-122	160	34	161	27	+2			7800				
-18	12	6	277	-225	-123	162	35	163	27	+2			7900				
-20	12	7	282	-230	-125	165	36	164	27	+1	6.0	5.2	8000				
-22	13	7	288	-235	-126	167	37	165	28	0			8100				
-24	13	7	293	-240	-128	170	38	167	28	-1			8200				
-26	13	7	299	-245	-129	172	39	168	28	-2			8300				
-29	13	8	306	-250	-131	175	40	169	28	-3			8400				
-33	14	8	315	-255	-133	177	41	171	29	-4	2.5	2.3	8500				
-39	15	3	327	-260	-134	177	42	172	29	-5			8600				
HIGH ANGLE FIRE																	
-45	16	10	325	-268	-135	177	42	169	27	-6			8500				
-50	17	11	322	-274	-136	177	42	167	25	-6			8400				
-53	18	12	319	-277	-146	177	42	165	23	-6			8300				
-55	19	12	317	-278	-145	177	42	163	22	-6			8200				
-57	19	13	315	-278	-144	159	42	162	21	-6			8100				
-59	20	14	313	-277	-142	157	41	161	21	-5			8000				
-61	21	14	310	-275	-140	154	41	159	20	-5			7900				
-63	21	15	308	-273	-138	152	40	158	20	-5			7800				
-65	22	15	306	-270	-136	150	40	157	19	-5			7700				
-66	22	16	304	-265	-134	148	39	156	19	-5	6		7600				

Table II

HE SHELL M55 with Fuze UTU, M51A5 and
HE SHELL OF-350 with Fuze KTM-1

RANGE		Range quadrant		Elevation		Maximum ordinate		Time of flight		Terminal velocity		Angle of fall		Probable error			Fork of 4 epr
		Stripe	Mil											Range	Deflection	Height	
1	1a	2	3	4	5	6	7	8	9	11	12	13	16				
7500	8202		1064	59° 50'	3754	55.4	262	1197	47	12							
7400	8093		1076	60 33	3798	55.8	262	1206	47	12							
7300	7983		1088	61 13	3839	56.2	263	1215	46	12							
7200	7874		1099	61 51	3878	56.5	263	1224	46	12							
7100	7765		1110	62 28	3915	56.8	264	1232	45	12						20	
7000	7655		1121	63 04	3950	57.1	264	1240	45	13							
6900	7546		1132	63 40	3982	57.4	265	1248	44	13							
6800	7436		1143	64 16	4212	57.7	265	1256	44	13							
6700	7327		1153	64 51	4040	58.1	266	1263	43	13							
6675	7300		1156	65 00	4047	58.2	266	1265	42	13						17	

4

4

Charge 4

V₀ = 398 m/s

CORRECTIONS												
Deflection, due to			RANGE, DUE TO									
Drt	Latent wind of 10 m/sec	Cant of carriage axis of 10 mil	HE, OF-350		Variation, of							
			Without the cap	With the cap	Air temp. Δt °C	Air pressure ΔH mm	Muzzle velocity V_0 m/sec	Temp. of powder ΔT_p °C	Weight of projectile for 2 signs	Range	Change in elevation of 1 mil displaces	RANGE
mil	W-D	W-R	on fuze KTM-1		°	H	MV	°p	W	meter	Height	m
17	18	19	21	22	22a	23	24	25	26	27	33	34
-67	23	16	302	-258	-132	146	39	154	19	-5		7500
-68	23	17	300	-250	-129	144	38	153	18	-5		7400
-69	24	17	299	-241	-125	142	38	152	18	-5		7300
-70	24	18	297	-232	-120	140	37	151	18	-4		7200
-72	25	18	295	-222	-114	138	37	149	18	-4		7100
-73	25	19	293	-202	-107	136	36	148	18	-4		7000
-74	25	19	291	-190	-100	134	36	147	18	-3		6900
-75	26	20	290	-175	-90	132	35	146	18	-3		6800
-76	26	20	288	-155	-75	130	35	145	18	-3		6700
-77	26	21	287	-140	-68	129	34	145	18	-3	11	6675

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Table IIa

**HE, AT SHELL BH-350/2
with FUZE K-451**

Range	Elevation			Summit of ordinate of the trajectory	Time of flight	Extreme velocity of projectile	Angle of fall	Probable error	
								Deflection	Height
	m	st.	mil	deg	m	sec.	m/sec	mil.	meters
1	2	3	4	6	7	8	9	12	13
100	2	3	0°11'	0.3	0.3	330	5.6	0.1	0.1
200	4	9	0 29	0.6	0.7	327	11.0	0.2	0.1
300	6	14	0 47	1.0	1.0	324	16.6	0.2	0.2
400	8	19	1 04	2.0	1.4	321	22.2	0.3	0.3
500	10	25	1 21	4.0	1.7	318	27.9	0.3	0.4
600	12	30	1 39	6	2.1	315	33.5	0.4	0.4
700	14	35	1 57	8	2.4	312	39.2	0.4	0.5
800	16	41	2 15	10	2.7	309	44.8	0.5	0.6
900	18	46	2 33	12	3.0	306	50.4	0.6	0.7
1000	20	51	2 51	16	3.4	303	56.3	0.7	0.8

Note: In case of greater range firing being required with this shell (over 1000 m), the table II for the third charge of HE Shell should be used.

PART VIII

AUXILIARY TABLES

PART VIII

AUXILIARY TABLES

Table IIIa

**CORRECTIONS OF ELEVATION FOR ANGLE OF SITE
LOW-ANGLE FIRE
ANGLE OF SITE POSITIVE + (S + p S)**

$\begin{array}{c} S \\ \diagdown \\ T \end{array}$	20	40	60	80	100	120	140	160	180	200	$\begin{array}{c} S \\ \diagup \\ T \end{array}$
CHARGE 1 AND 2											
100	20	40	60	80	101	121	142	162	183	203	100
150	20	41	61	81	102	122	143	163	184	205	150
200	20	41	62	82	103	123	144	165	186	208	200
250	21	42	64	85	106	127	148	169	191	213	250
300	22	44	67	90	112	134	156	178	202	230	300
350	23	47	71	96	120	144	167	190	236	275	350
400	25	50	77	103	130	158	186	214	298	—	400
450	28	56	84	113	143	176	233	—	—	—	450
500	32	64	101	143	190	—	—	—	—	—	500
550	39	82	150	—	—	—	—	—	—	—	550
600	51	150	—	—	—	—	—	—	—	—	600

Table IIIa

**CORRECTIONS OF ELEVATION FOR ANGLE OF SITE
LOW-ANGLE FIRE
ANGLE OF SITE POSITIVE + (S + p S)**

$\begin{array}{c} S \\ \diagdown \\ T \end{array}$	20	40	60	80	100	120	140	160	180	200	$\begin{array}{c} S \\ \diagup \\ T \end{array}$
CHARGE 3 AND 4											
100	20	40	60	80	101	121	141	162	183	203	100
150	20	40	61	81	101	122	142	163	184	205	150
200	21	41	62	82	103	123	144	165	186	207	200
250	21	42	63	84	105	126	147	168	189	211	250
300	22	43	64	85	107	129	151	172	194	217	300
350	22	44	66	88	110	133	156	178	201	226	350
400	23	46	69	93	116	142	168	193	218	244	400
450	24	49	74	100	125	151	—	—	—	—	450
500	26	56	85	118	156	—	—	—	—	—	500
550	30	78	126	—	—	—	—	—	—	—	550
600	43	110	—	—	—	—	—	—	—	—	600

Table IIIb

**CORRECTIONS OF ELEVATION FOR ANGLE OF SITE
LOW-ANGLE FIRE
ANGLE OF SITE NEGATIVE — (S + p S)**

$\begin{matrix} S \\ T \end{matrix}$	20	40	60	80	100	120	140	160	180	200	$\begin{matrix} S \\ T \end{matrix}$
CHARGE 1 AND 2											
100	20	40	60	80	101	121	142	162	183	203	100
150	20	40	61	81	102	123	144	164	185	205	150
200	20	41	62	82	103	125	146	167	188	208	200
250	21	42	63	83	104	127	149	171	192	212	250
300	21	43	64	85	106	129	152	175	197	218	300
350	22	45	67	89	111	135	159	183	206	228	350
400	24	48	72	95	119	144	169	194	218	241	400
450	26	52	78	103	129	154	180	206	230	254	450
500	29	58	86	113	140	165	192	219	244	269	500
550	34	66	97	126	154	180	208	236	262	288	550
600	40	76	110	142	172	202	231	260	288	—	600
650	54	97	134	170	200	231	263	293	—	—	650

Table IIIb

**CORRECTIONS OF ELEVATION FOR ANGLE OF SITE
LOW-ANGLE FIRE
ANGLE OF SITE NEGATIVE — (S + p S)**

$\begin{matrix} S \\ T \end{matrix}$	20	40	60	80	100	120	140	160	180	200	$\begin{matrix} S \\ T \end{matrix}$
CHARGE 3 AND 4											
100	20	40	60	80	101	121	142	162	183	203	100
150	20	40	61	81	102	122	143	163	184	205	150
200	20	40	61	82	103	123	144	164	185	207	200
250	20	41	62	83	104	124	145	166	188	209	250
300	21	42	63	84	105	126	147	168	190	212	300
350	21	42	64	85	106	128	149	171	193	216	350
400	22	43	65	87	108	130	152	174	196	221	400
450	23	45	68	90	112	134	158	181	204	230	450
500	25	48	74	96	119	142	166	191	215	242	500
550	28	54	84	107	131	153	180	206	231	259	550
600	36	66	99	124	148	172	198	225	252	282	600
650	49	85	118	146	170	195	222	250	279	—	650
700	68	112	144	175	203	227	252	281	—	—	700

Table IIIc

**CORRECTION OF ELEVATION FOR ANGLE OF SITE
HIGH-ANGLE FIRE**
ANGLE OF SITE POSITIVE + (S — ps)

S	20	40	60	80	100	120	140	160	180	200	S
T											T
CHARGE 1											
800											800
820											820
840											840
860											860
880	60										880
900	44										900
920	33	83									920
940	25	65									940
960	21	50	88								960
980	17	40	70	108							980
1000	15	33	55	86							1000
1020	13	27	44	68	102						1020
1040	11	23	37	55	78	119					1040
1060	10	20	32	46	63	83	112				1060
1080	9	17	28	39	52	68	87	114			1080
1100	8	15	24	34	44	57	71	89	116		1100
1120	7	13	21	29	38	48	59	72	89	107	1120
1140	6	12	18	25	32	40	50	60	72	86	1140
1160	5	11	16	22	28	34	43	51	60	71	1160

Table IIIc

**CORRECTION OF ELEVATION FOR ANGLE OF SITE
HIGH-ANGLE FIRE**
ANGLE OF SITE POSITIVE + (S — ps)

S	20	40	60	80	100	120	140	160	180	200	S
T											T
CHARGE 2, 3 AND 4											
800											800
820											820
840											840
860											860
880	55										880
900	38	96									900
920	29	75									920
940	23	57									940
960	19	44	82								960
980	16	36	62	105							980
1000	14	30	50	77							1000
1020	12	26	42	61	81						1020
1040	10	22	35	51	70	95					1040
1060	9	19	30	43	57	75	99				1060
1080	8	16	26	36	48	62	79	100			1080
1100	7	14	22	31	41	52	65	79	103		1100
1120	6	12	19	27	35	44	55	65	79		1120
1140	5	11	17	24	30	38	47	55	65		1140
1160	5	10	15	21	26	32	40	47	56		1160

Table IIIc

**CORRECTION OF ELEVATION FOR ANGLE OF SITE
HIGH-ANGLE FIRE
ANGLE OF SITE POSITIVE + (S — ps)**

$\begin{matrix} S \\ T \end{matrix}$	20	40	60	80	100	120	140	160	180	200	$\begin{matrix} S \\ T \end{matrix}$
CHARGE 1											
800											800
820											820
840											840
860											860
880	60										880
900	44										900
920	33	83									920
940	26	65									940
960	21	50	88								960
980	17	40	70	108							980
1000	15	33	55	86							1000
1020	13	27	44	68	102						1020
1040	11	23	37	55	78	119					1040
1060	10	20	32	46	63	83	112				1060
1080	9	17	28	39	52	68	87	114			1080
1100	8	15	24	34	44	57	71	89	116		1100
1120	7	13	21	29	38	48	59	72	89	107	1120
1140	6	12	18	25	32	40	50	60	72	86	1140
1160	5	11	16	22	28	34	43	51	60	71	1160

Table IIIc

**CORRECTION OF ELEVATION FOR ANGLE OF SITE
HIGH-ANGLE FIRE
ANGLE OF SITE POSITIVE + (S — ps)**

$\begin{matrix} S \\ T \end{matrix}$	20	40	60	80	100	120	140	160	180	200	$\begin{matrix} S \\ T \end{matrix}$
CHARGE 2, 3 AND 4											
800											800
820											820
840											840
860											860
880	55										880
900	38	96									900
920	29	75									920
940	23	57									940
960	19	44	82								960
980	16	36	62	105							980
1000	14	30	50	77							1000
1020	12	26	42	61	81						1020
1040	10	22	35	51	70	95					1040
1060	9	19	30	43	57	75	99				1060
1080	8	16	26	36	48	62	79	100			1080
1100	7	14	22	31	41	52	65	79	103		1100
1120	6	12	19	27	35	44	55	65	79		1120
1140	5	11	17	24	30	38	47	55	65		1140
1160	5	10	15	21	26	32	40	47	56		1160

Table IIIa

**CORRECTION OF ELEVATION FOR ANGLE OF SITE
HIGH-ANGLE FIRE
ANGLE OF SITE NEGATIVE — (S — pS)**

$\begin{matrix} S \\ T \end{matrix}$	20	40	60	80	100	120	140	160	180	200	$\begin{matrix} S \\ T \end{matrix}$
CHARGE 1											
800	75	107	129	147	161	173	181	190			800
820	63	91	113	130	144	156	166	176			820
840	51	78	99	116	129	142	152	162			840
860	41	66	86	102	116	128	139	148			860
880	33	56	74	90	103	115	126				880
900	27	48	65	79	92	103	113				900
920	23	41	57	70	83	93	103				920
940	20	36	50	63	74	84					940
960	17	32	44	56	66	75					960
980	15	28	39	49	59						980
1000	13	25	35	44	52						1000
1020	11	22	31	39							1020
1040	10	19	28	35							1040
1060	9	17	25								1060
1080	8	15									1080
1100	7	13									1100
1120	6										1120
1140											1140

Table IIIb

**CORRECTION OF ELEVATION FOR ANGLE OF SITE
HIGH-ANGLE FIRE
ANGLE OF SITE NEGATIVE — (S — pS)**

$\begin{matrix} S \\ T \end{matrix}$	20	40	60	80	100	120	140	160	180	200	$\begin{matrix} S \\ T \end{matrix}$
CHARGE 2, 3 AND 4											
800	66	97	120	137	150	160	167	173	179		800
820	53	82	104	122	136	147	155	161	166		820
840	43	69	91	108	123	135	144	150			840
860	36	60	79	96	111	123	132	139			860
880	30	52	69	85	99	112	121				880
900	25	45	61	76	89	102	111				900
920	22	39	53	67	81	93	103				920
940	19	34	47	59	73	84					940
960	16	30	42	53	66	76					960
980	14	26	37	48	59						980
1000	12	23	33	43	53						1000
1020	10	20	29	39							1020
1040	11	18	26	35							1040
1060	9	16	23	31							1060
1080	8	14	20								1080
1100	7	12									1100
1120	6										1120
1140	5										1140
1160	4										1160

Table IVa

TABLE OF FRONT

$$c = a \cdot \lambda$$

$$a = c \cdot \frac{1}{\lambda}$$

Angle of fall θ	Slope in %						
	1%	2%	4%	6%	8%	10%	15%
Mils	10	20	41	61	81	102	152
20	0.67	0.50	0.33	0.25	0.20	0.16	0.12
40	0.80	0.67	0.49	0.40	0.33	0.28	0.21
60	0.86	0.75	0.59	0.50	0.43	0.37	0.28
80	0.89	0.80	0.66	0.57	0.50	0.44	0.35
100	0.91	0.83	0.71	0.62	0.55	0.50	0.40
150	0.94	0.88	0.79	0.71	0.65	0.60	0.50
200	0.95	0.91	0.83	0.77	0.72	0.67	0.58
250	0.96	0.93	0.86	0.81	0.76	0.72	0.63
300	0.97	0.94	0.88	0.84	0.79	0.76	0.68
350	0.97	0.95	0.90	0.86	0.82	0.78	0.71
400	0.98	0.96	0.91	0.87	0.84	0.81	0.74
500	0.98	0.96	0.93	0.90	0.87	0.85	0.79
600	0.99	0.97	0.94	0.92	0.90	0.87	0.83
700	0.99	0.98	0.95	0.93	0.91	0.89	0.85
800	0.99	0.98	0.96	0.95	0.93	0.91	0.88
900	0.99	0.98	0.97	0.95	0.94	0.93	0.90
1000	0.99	0.99	0.98	0.96	0.95	0.94	0.92
1100	0.99	0.99	0.98	0.97	0.96	0.95	0.93
1200	0.99	0.99	0.98	0.97	0.97	0.97	0.95
1300	1.00	0.99	0.99	0.98	0.98	0.98	0.97
1400	1.00	1.00	0.99	0.99	0.99	0.99	0.98

SLOPE COEFFICIENT

c — jump on the ground
a — jump on the range quadrant
 λ — slope coefficient

or in mils							Angle of fall θ
20%	25%	30%	40%	50%	60%	∞	
201	250	297	388	472	550	1600	Mils
0.09	0.07	0.06	0.05	0.04	0.04	0.02	20
0.17	0.14	0.12	0.10	0.08	0.07	0.04	40
0.23	0.20	0.17	0.14	0.12	0.10	0.06	60
0.29	0.25	0.22	0.18	0.15	0.14	0.08	80
0.34	0.29	0.26	0.21	0.18	0.16	0.10	100
0.43	0.38	0.35	0.29	0.26	0.23	0.15	150
0.51	0.46	0.42	0.36	0.32	0.29	0.20	200
0.57	0.52	0.47	0.41	0.37	0.34	0.25	250
0.62	0.56	0.53	0.47	0.42	0.39	0.30	300
0.65	0.61	0.57	0.51	0.47	0.44	0.36	350
0.69	0.64	0.61	0.55	0.51	0.48	0.41	400
0.74	0.70	0.67	0.62	0.58	0.55	0.53	500
0.79	0.75	0.72	0.67	0.64	0.61	0.67	600
0.82	0.79	0.76	0.72	0.69	0.67	0.82	700
0.85	0.82	0.80	0.77	0.75	0.73	1.00	800
0.88	0.85	0.84	0.81	0.79	0.78	1.22	900
0.90	0.88	0.87	0.85	0.84	0.83	1.50	1000
0.92	0.90	0.90	0.89	0.88	0.88	1.87	1100
0.94	0.93	0.93	0.93	0.93	0.93	2.42	1200
0.96	0.95	0.95	0.97	0.98	0.98	3.31	1300
0.98	0.98	0.98	1.00	1.02	1.04	5.00	1400

Table IVb

TABLE OF REAR

$$c = a \cdot \lambda$$

$$a = c \cdot \frac{1}{\lambda}$$

Angle of fall θ	Slope in %						
	1%	2%	3%	4%	5%	6%	8%
Mils	10	20	31	41	51	61	81
20	2.00	—	—	—	—	—	—
40	1.33	—	—	—	—	—	—
60	1.20	1.50	2.07	3.16	6.57	—	—
80	1.14	1.23	1.62	2.05	2.76	4.21	—
100	1.11	1.25	1.45	1.69	2.03	2.56	5.26
150	1.07	1.15	1.26	1.37	1.51	1.68	2.17
200	1.05	1.11	1.18	1.25	1.34	1.43	1.67
250	1.04	1.09	1.14	1.19	1.25	1.32	1.47
300	1.03	1.07	1.11	1.15	1.20	1.25	1.36
350	1.03	1.06	1.09	1.13	1.16	1.20	1.29
400	1.02	1.05	1.08	1.11	1.14	1.17	1.24
500	1.02	1.04	1.06	1.08	1.10	1.13	1.18
600	1.01	1.03	1.05	1.07	1.08	1.10	1.14
700	1.01	1.02	1.04	1.05	1.07	1.08	1.11
800	1.01	1.02	1.03	1.04	1.05	1.07	1.09
900	1.01	1.02	1.03	1.04	1.04	1.05	1.07
1000	1.01	1.01	1.02	1.03	1.04	1.04	1.06
1100	1.01	1.01	1.02	1.02	1.03	1.03	1.05
1200	1.00	1.01	1.01	1.02	1.02	1.03	1.04
1300	1.00	1.01	1.01	1.02	1.02	1.02	1.03
1400	1.00	1.00	1.01	1.01	1.01	1.01	1.02

SLOPE COEFFICIENT

c — jump on the ground
a — jump on the range quadrant
 λ — slope coefficient

or in mils								Angle of fall θ
10%	15%	20%	25%	30%	40%	50%	60%	
102	152	201	250	297	388	472	550	Mils
—	—	—	—	—	—	—	—	20
—	—	—	—	—	—	—	—	40
—	—	—	—	—	—	—	—	60
—	—	—	—	—	—	—	—	80
—	—	—	—	—	—	—	—	100
3.12	—	—	—	—	—	—	—	150
2.03	4.14	—	—	—	—	—	—	200
1.68	2.53	5.03	—	—	—	—	—	250
1.50	2.01	2.99	5.92	9.88	—	—	—	300
1.40	1.74	2.31	3.44	6.48	—	—	—	350
1.33	1.59	1.97	2.61	3.64	—	—	—	400
1.24	1.41	1.63	1.94	2.38	4.29	17.14	—	500
1.18	1.30	1.46	1.65	1.89	2.69	4.43	11.32	600
1.15	1.24	1.35	1.48	1.65	2.10	2.86	4.32	700
1.12	1.19	1.27	1.38	1.49	1.80	2.23	2.91	800
1.10	1.15	1.22	1.30	1.39	1.60	1.89	2.29	900
1.08	1.12	1.18	1.24	1.31	1.47	1.68	1.94	1000
1.06	1.10	1.15	1.20	1.24	1.37	1.53	1.71	1100
1.05	1.08	1.12	1.16	1.19	1.29	1.41	1.55	1200
1.04	1.06	1.09	1.12	1.15	1.23	1.32	1.43	1300
1.03	1.04	1.06	1.09	1.11	1.18	1.24	1.33	1400

Table V

NATURAL TRIGONOMETRIC (for angles

Angle in mls	Tang.	Difference for 1 mil	Sin.	Difference for 1 mil	Cos.	Difference for 1 mil	Angle in mls	Tang.	Difference for 1 mil	Sin.	Difference for 1 mil	Cos.	Difference for 1 mil
10	0.010		0.010		1.000		410	0.426		0.392		0.920	
20	0.020		0.020		1.000		420	0.438		0.401		0.916	0.4
30	0.029		0.029		1.000	0.0	430	0.449		0.410		0.912	
40	0.039		0.039		1.000		440	0.461		0.419		0.908	
50	0.049		0.049		0.999		450	0.473	1.2	0.428	0.9	0.905	
60	0.059		0.059		0.999		460	0.485		0.436		0.900	
70	0.069		0.068		0.998		470	0.497		0.445		0.895	
80	0.079		0.078		0.997		480	0.510		0.454		0.891	
90	0.089		0.088		0.996		490	0.522		0.463		0.887	
100	0.099		0.098		0.995	0.1	500	0.535		0.472		0.883	0.5
110	0.108		0.107		0.994		510	0.547		0.480		0.877	
120	0.118		0.117		0.993		520	0.560		0.489		0.873	
130	0.128	1.0	0.127		0.992		530	0.573		0.497		0.868	
140	0.138		0.137		0.991		540	0.586	1.3	0.505		0.863	
150	0.148		0.146		0.990		550	0.599		0.514		0.858	
160	0.158		0.156		0.988		560	0.613		0.522		0.853	
170	0.169		0.166		0.986		570	0.626		0.532		0.847	
180	0.179		0.176		0.984		580	0.640		0.540		0.842	
190	0.189		0.185	1.0	0.982		590	0.654		0.548	0.8	0.837	
200	0.199		0.195		0.980		600	0.668	1.4	0.556		0.831	
210	0.209		0.205		0.978		610	0.683		0.564		0.826	
220	0.220		0.214		0.976	0.2	620	0.697		0.572		0.821	
230	0.230		0.223		0.974		630	0.712		0.580		0.815	
240	0.240		0.233		0.972		640	0.727		0.588		0.809	
250	0.251		0.243		0.970		650	0.742	1.5	0.596		0.803	
260	0.261		0.252		0.968		660	0.757		0.604		0.797	0.6
270	0.271		0.261		0.966		670	0.762		0.611		0.791	
280	0.282		0.271		0.963		680	0.788		0.619		0.785	
290	0.293		0.281		0.960		690	0.804		0.627		0.779	
300	0.304		0.290		0.957		700	0.821	1.6	0.634		0.773	
310	0.314		0.300		0.954		710	0.837		0.641		0.767	
320	0.325	1.1	0.310		0.951	0.3	720	0.854		0.649		0.760	
330	0.336		0.320		0.948		730	0.871		0.656	0.7	0.754	
340	0.347		0.329		0.945		740	0.889	1.7	0.664		0.747	
350	0.358		0.338		0.942		750	0.906		0.671		0.741	
360	0.369		0.347		0.939		760	0.924	1.8	0.679		0.735	
370	0.380		0.356	0.9	0.936		770	0.943		0.686		0.728	
380	0.392		0.365		0.932		780	0.952	1.9	0.693		0.721	0.7
390	0.403		0.374		0.928	0.4	790	0.960	2.0	0.700		0.714	
400	0.414		0.383		0.924		800	1.000		0.707		0.707	

FUNCTIONS in mils)

Angle in mls	Tang.	Difference for 1 mil	Sin.	Difference for 1 mil	Cos.	Difference for 1 mil	Angle in mls	Tang.	Difference for 1 mil	Sin.	Difference for 1 mil	Cos.	Difference for 1 mil
810	1.020		0.714		0.700		1210	2.482	7.0	0.928		0.371	
820	1.040	2.0	0.721	0.7	0.693		1220	2.556	7.5	0.932	0.4	0.365	
830	1.061	2.1	0.728		0.686		1230	2.630	8.0	0.936		0.356	
840	1.082		0.735		0.679		1240	2.711	8.5	0.939		0.347	
850	1.104	2.2	0.741		0.671		1250	2.795	9.0	0.942		0.338	
860	1.126		0.747		0.664	0.7	1260	2.885	9.5	0.945		0.329	
870	1.148	2.3	0.754		0.656		1270	2.976	10	0.948		0.320	
880	1.171		0.760		0.649		1280	3.078		0.951		0.309	
890	1.195	2.4	0.767		0.641		1290	3.184		0.954	0.3	0.300	0.9
900	1.219		0.773		0.634		1300	3.298		0.957		0.290	
910	1.243	2.5	0.779	0.6	0.627		1310	3.416		0.960		0.281	
920	1.268	2.6	0.785		0.619		1320	3.546		0.963		0.271	
930	1.294	2.7	0.791		0.611		1330	3.684		0.966		0.261	
940	1.321	2.7	0.797		0.604		1340	3.834		0.968		0.252	
950	1.348	2.8	0.803		0.596		1350	3.991		0.970		0.243	
960	1.376	2.9	0.809		0.588		1360	4.165		0.972		0.233	
970	1.405	3.0	0.815		0.580		1370	4.354		0.974		0.223	
980	1.435	3.1	0.821		0.572	0.8	1380	4.561		0.976		0.214	
990	1.466	3.1	0.826		0.564		1390	4.773		0.978		0.205	
1000	1.497	3.2	0.831		0.556		1400	5.027		0.980	0.2	0.195	
1010	1.529	3.3	0.837		0.548		1410	5.309		0.982		0.185	
1020	1.563	3.4	0.842		0.540		1420	5.605		0.984		0.178	
1030	1.597	3.5	0.847		0.531		1430	5.933		0.986		0.166	
1040	1.632	3.6	0.853		0.522		1440	6.314		0.988		0.156	
1050	1.668	3.7	0.858		0.514		1450	6.745		0.990		0.146	
1060	1.707	3.9	0.863	0.5	0.505		1460	7.238		0.991		0.137	
1070	1.746	4.0	0.868		0.497		1470	7.788		0.992		0.127	
1080	1.786	4.2	0.873		0.488		1480	8.449		0.993		0.117	
1090	1.828	4.4	0.878		0.480		1490	9.227		0.994		0.107	1.0
1100	1.872	4.5	0.883		0.472		1500	10.17		0.995	0.1	0.098	
1110	1.917	4.6	0.887		0.463		1510	11.27		0.996		0.088	
1120	1.963	4.9	0.891		0.454		1520	12.20		0.997		0.078	
1130	2.012	5.0	0.895		0.445		1530	14.05		0.998		0.068	
1140	2.062	5.2	0.900		0.436		1540	17.00		0.999		0.059	
1150	2.114	5.5	0.905		0.428	0.9	1550	20.33		0.999		0.049	
1160	2.169	5.7	0.908		0.419		1560	25.45		1.000		0.039	
1170	2.226	6.1	0.912		0.410		1570	34.05		1.000	0.1	0.029	
1180	2.287	6.3	0.916	0.4	0.401		1580	51.30		1.000		0.020	
1190	2.340	6.4	0.920		0.392		1590	101.9		1.000		0.010	
1200	2.414	6.8	0.924		0.383		1600	∞		1.000		0.000	

Table VI

DECOMPOSING OF BALLISTIC WIND INTO COMPONENTS

Angle of wind 1-00				Speed of ballistic wind in m/sec									
				1	2	3	4	5	6	7	8	9	10
				Components of ballistic wind									
				1	2	3	4	5	6	7	8	9	10
0	32	32	64	—	—	—	—	—	—	—	—	—	—
1	31	33	63	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0
2	30	34	62	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	2,0
3	29	35	61	1,0	2,0	2,9	3,9	4,9	5,9	6,9	7,9	8,8	9,8
4	28	36	60	0,2	0,4	0,6	0,8	1,0	1,2	1,4	1,6	1,8	1,0
5	27	37	59	0,9	1,9	2,9	3,8	4,8	5,7	6,7	7,7	8,6	9,6
6	26	38	58	0,3	0,6	0,9	1,2	1,5	1,7	2,0	2,3	2,6	2,9
7	25	39	57	0,9	1,8	2,6	3,7	4,6	5,5	6,5	7,4	8,3	9,2
8	24	40	56	0,4	0,8	1,1	1,5	1,9	2,3	2,7	3,1	3,4	3,8
9	23	41	55	0,9	1,8	2,6	3,5	4,4	5,3	6,2	7,1	7,9	8,8
10	22	42	54	0,5	0,9	1,4	1,9	2,4	2,8	3,3	3,8	4,2	4,7
11	21	43	53	0,8	1,7	2,5	3,3	4,2	5,0	5,8	6,7	7,5	8,3
12	20	44	52	0,6	1,1	1,7	2,2	2,8	3,3	3,9	4,4	5,0	5,6
13	19	45	51	0,8	1,5	2,3	3,1	3,9	4,6	5,4	6,2	7,0	7,7
14	18	46	50	8,6	1,3	1,9	2,5	3,2	3,8	4,4	5,1	5,7	6,3
15	17	47	49	0,7	1,4	2,1	2,8	3,5	4,2	4,9	5,7	6,4	7,1
16	16	48	48	0,7	1,4	2,1	2,8	3,5	4,2	4,9	5,7	6,4	7,1
				0,6	1,3	1,9	2,5	3,2	3,8	4,4	5,1	5,7	6,3
				0,5	1,5	2,3	3,1	3,9	4,6	5,4	6,2	7,0	7,7
				0,6	1,1	1,7	2,2	2,8	3,3	3,9	4,4	5,0	5,6
				0,8	1,7	2,5	3,3	4,2	5,0	5,8	6,7	7,5	8,3
				0,5	0,9	1,4	1,9	2,4	2,8	3,3	3,8	4,2	4,7
				0,9	1,8	2,6	3,5	4,4	5,3	6,2	7,1	7,9	8,8
				0,4	0,8	1,1	1,5	1,9	2,3	2,7	3,1	3,4	3,8
				0,9	1,8	2,6	3,7	4,6	5,5	6,5	7,4	8,3	9,2
				0,3	0,6	0,9	1,2	1,5	1,7	2,0	2,3	2,6	2,9
				1,9	1,9	2,9	3,8	4,8	5,7	6,7	7,7	8,6	9,6
				0,2	0,4	0,6	0,8	1,0	1,2	1,4	1,6	1,8	2,0
				4,0	2,0	2,9	3,9	4,9	5,9	6,9	7,9	8,8	9,8
				0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0
				1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10
				—	—	—	—	—	—	—	—	—	—
				1	2	3	4	5	6	7	8	9	10

Table VII

PROBABILITY FACTOR

$\frac{T}{P_e} = \frac{\text{Wideness of the target in meters}}{\text{Probability error in meters}}$							
$\frac{T}{P_e}$	%	$\frac{T}{P_e}$	%	$\frac{T}{P_e}$	%	$\frac{T}{P_e}$	%
0,1	2,7	2,1	52,1	4,1	83,3	6,1	96,0
0,2	5,4	2,2	54,2	4,2	84,3	6,2	96,3
0,3	8,1	2,3	56,2	4,3	85,2	6,3	96,6
0,4	10,7	2,4	58,2	4,4	86,2	6,4	96,9
0,5	13,3	2,5	60,0	4,5	88,5	6,5	97,1
0,6	16,0	2,6	61,9	4,6	87,9	6,6	97,4
0,7	18,6	2,7	63,7	4,7	88,7	6,7	97,6
0,8	21,3	2,8	65,5	4,8	89,5	6,8	97,8
0,9	23,8	2,9	67,1	4,9	90,1	6,9	98,0
1,0	26,4	3,0	68,8	5,0	90,8	7,0	98,2
1,1	28,9	3,1	70,3	5,1	91,4	7,1	98,3
1,2	31,4	3,2	71,9	5,2	92,1	7,2	98,5
1,3	33,8	3,3	73,3	5,3	92,6	7,3	98,6
1,4	36,3	3,4	74,8	5,4	93,1	7,4	98,7
1,5	38,7	3,5	76,1	5,5	93,6	7,5	98,8
1,6	41,1	3,6	77,5	5,6	94,1	7,6	99,0
1,7	43,3	3,7	78,7	5,7	94,5	7,7	99,0
1,8	45,6	3,8	80,0	5,8	95,0	7,8	99,1
1,9	47,8	3,9	81,1	5,9	95,3	7,9	99,2
2,0	50,0	4,0	82,3	6,0	95,7	8,0	99,3

Table VIIa

CONVERSION TABLE MILS TO DEGREES

Mils	1/6400	Mils	1/6400
	Degrees and minutes		Degrees and minutes
100	5'37"	3600	202°30'
200	11 15	3700	208 07
300	16 52	3800	213 45
400	22 30	3900	219 22
500	28 07	4000	225 00
600	33 45	4100	230 37
700	39 22	4200	236 15
800	45 00	4300	241 52
900	50 37	4400	247 30
1000	56 15	4500	253 07
1100	61 52	4600	258 45
1200	67 30	4700	264 22
1300	73 07	4800	270 00
1400	78 45	4900	275 37
1500	84 22	5000	281 15
1600	90 00	5100	286 52
1700	95 37	5200	292 30
1800	101 15	5300	298 07
1900	106 52	5400	303 45
2000	112 30	5500	309 22
2100	118 07	5600	315 00
2200	123 45	5700	320 37
2300	129 22	5800	326 15
2400	135 00	5900	331 52
2500	140 37	6000	337 30
2600	146 15	6100	343 07
2700	151 52	6200	348 45
2800	157 30	6300	354 22
2900	163 07	6400	360 00
3000	168 45		
3100	174 22		
3200	180 00		
3300	185 37		
3400	191 15		
3500	196 52		

Table VIIb

CONVERSION TABLE MILS TO DEGREES AND MINUTES

Mils	1/6400	Mils	1/6400	Mils	1/6400
	Degrees and minutes		Degrees and minutes		Degrees and minutes
1	0° 3,4'	34	1° 55'	67	3° 46'
2	0 6,7	35	1 58	68	3 49
3	0 10,1	36	2 1	69	3 53
4	0 13,5	37	2 4	70	3 56
5	0 16,8	38	2 8	71	3 59
6	0 20,2	39	2 11	72	4 3
7	0 23,6	40	2 15	73	4 6
8	0 27,0	41	2 18	74	4 10
9	0 30,4	42	2 22	75	4 13
10	0 33,7	43	2 25	76	4 16
11	0 37,1	44	2 28	77	4 20
12	0 40,5	45	2 31	78	4 23
13	0 43,9	46	2 35	79	4 26
14	0 47,2	47	2 38	80	4 30
15	0 50,6	48	2 42	81	4 33
16	0 54,0	49	2 45	82	4 36
17	0 57,4	50	2 49	83	4 40
18	1 0,7	51	2 52	84	4 43
19	1 4,1	52	2 55	85	4 47
20	1 8	53	2 59	86	4 50
21	1 11	54	3 2	87	4 53
22	1 14	55	3 5	88	4 57
23	1 18	56	3 9	89	5 00
24	1 21	57	3 12	90	5 3
25	1 24	58	3 16	91	5 7
26	1 28	59	3 19	92	5 10
27	1 31	60	3 22	93	5 14
28	1 35	61	3 26	94	5 17
29	1 38	62	3 29	95	5 20
30	1 42	63	3 32	96	5 24
31	1 45	64	3 35	97	5 27
32	1 48	65	3 39	98	5 30
33	1 51	66	3 43	99	5 34

Table IXa

CONVERSION TABLE DEGREES TO MILS

Degrees	Mils	Degrees	Mils
	1/6400		1/6400
1	17.8	46	818
2	35.6	47	836
3	53.3	48	853
4	71.1	49	871
5	88.9	50	889
6	107	51	907
7	124	52	924
8	142	53	942
9	160	54	960
10	178	55	978
11	196	56	996
12	213	57	1013
13	231	58	1031
14	249	59	1049
15	267	60	1067
16	284	61	1084
17	302	62	1102
18	320	63	1120
19	338	64	1138
20	356	65	1156
21	373	66	1173
22	391	67	1191
23	409	68	1209
24	427	69	1227
25	444	70	1244
26	462	71	1262
27	480	72	1280
28	498	73	1298
29	516	74	1316
30	533	75	1333
31	551	76	1351
32	569	77	1369
33	587	78	1387
34	604	79	1404
35	622	80	1422
36	640	81	1440
37	658	82	1458
38	676	83	1476
39	693	84	1493
40	711	85	1511
41	729	86	1529
42	747	87	1547
43	764	88	1564
44	782	89	1582
45	800	90	1600

Table IXb

CONVERSION TABLE MINUTES TO MILS

Minutes	Mils	Minutes	Mils
	1/6400		1/6400
1	0.3	31	9.2
2	0.6	32	9.5
3	0.9	33	9.8
4	1.2	34	10.1
5	1.5	35	10.4
6	1.8	36	10.7
7	2.1	37	11.0
8	2.4	38	11.3
9	2.7	39	11.6
10	3.0	40	11.9
11	3.3	41	12.1
12	3.6	42	12.4
13	3.9	43	12.7
14	4.1	44	13.0
15	4.4	45	13.3
16	4.7	46	13.6
17	5.0	47	13.9
18	5.3	48	14.2
19	5.6	49	14.5
20	5.9	50	14.8
21	6.2	51	15.1
22	6.5	52	15.4
23	6.8	53	15.7
24	7.1	54	16.0
25	7.4	55	16.3
26	7.7	56	16.6
27	8.0	57	16.9
28	8.3	58	17.2
29	8.6	59	17.5
30	8.9	60	17.8

Table Xa

COMPUTING OF AIR PRESSURE (AIR DENSITY) FOR FP
FP above MS

MS above	Air pressure (air density) at the metro station																				
	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780
50	577	587	596	607	616	625	636	646	656	666	676	686	696	706	716	726	736	746	756	766	775
100	574	583	593	603	613	623	633	643	653	663	673	683	693	703	713	723	733	743	753	763	771
150	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	768
200	566	576	586	596	606	616	626	636	646	656	666	676	686	696	706	716	726	736	746	756	764
250	563	573	583	593	603	613	623	633	643	653	663	673	683	693	703	713	723	733	743	753	761
300	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	758
350	557	567	577	587	597	607	617	627	637	647	657	667	677	687	697	707	717	727	737	747	755
400	554	564	574	584	594	604	614	624	634	644	654	664	674	684	694	704	714	724	734	744	752
450	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	748
500	547	556	565	575	585	594	604	613	623	632	641	650	660	669	679	689	698	707	717	725	735
550	543	553	562	572	581	590	600	609	619	628	638	646	656	665	675	684	694	703	712	721	731
600	540	550	559	569	578	587	597	606	615	624	634	642	652	661	671	680	690	699	708	718	727
650	537	547	556	565	574	583	593	602	611	621	630	639	648	657	667	676	686	694	703	713	722
700	534	544	553	562	571	580	589	598	607	616	625	634	643	652	661	670	679	688	697	706	715
750	531	540	550	559	568	577	586	595	604	614	622	631	640	649	658	667	676	685	694	703	712
800	528	537	546	555	564	573	582	592	600	610	619	628	637	646	655	664	674	683	692	700	710
850	525	534	543	552	561	570	579	588	597	606	615	624	633	642	651	660	669	678	687	696	705
900	522	531	540	549	558	567	576	585	594	603	612	621	630	639	648	657	666	675	684	693	701
950	519	528	537	546	555	564	573	582	591	600	609	618	627	636	645	654	663	672	681	690	699
1000	516	525	534	543	552	561	570	579	588	597	606	615	624	633	642	651	660	669	678	687	696

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Table Xb

COMPUTING OF AIR PRESSURE (AIR DENSITY) FOR FP
FP below MS

FP below	Air pressure (air density) at the metro station																				
	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780
MS																					
50	584	594	604	614	624	634	644	654	664	674	684	694	704	714	724	734	745	755	765	775	785
100	587	597	607	618	628	638	648	658	668	678	688	698	708	718	728	738	749	759	769	779	790
150	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
200	594	604	614	624	634	644	654	664	674	684	694	704	714	724	734	744	754	764	774	784	794
250	598	608	618	628	638	648	658	668	678	688	698	708	718	728	738	748	758	768	778	788	803
300	601	612	622	632	643	653	663	674	684	694	705	715	725	735	746	756	767	777	788	798	808
350	604	615	625	635	646	656	667	677	688	698	709	720	730	740	751	762	773	784	795	806	817
400	608	619	629	639	650	661	671	682	692	703	713	724	734	745	755	766	776	787	797	807	817
450	612	623	633	643	654	665	675	686	696	707	717	728	738	749	759	770	781	792	802	812	827
500	615	626	637	647	658	669	679	690	700	711	722	732	743	753	764	775	785	796	807	817	827
550	619	630	640	651	662	673	683	694	705	715	726	736	747	758	769	780	790	801	812	822	832
600	623	633	644	655	666	677	687	698	709	720	730	741	752	763	773	784	795	806	816	826	837
650	627	637	648	659	670	681	691	702	713	724	734	745	756	767	778	789	800	811	821	832	842
700	631	641	652	663	674	685	696	706	717	728	738	749	760	771	782	793	804	815	825	836	847
750	634	645	656	667	678	689	700	711	722	733	743	754	765	776	787	798	809	820	830	841	852
800	638	649	660	671	682	693	704	714	725	737	747	759	770	781	791	803	814	825	836	846	857
850	642	653	664	675	686	697	708	718	730	741	752	763	775	785	796	808	819	830	840	851	862
900	645	657	668	679	690	701	712	723	734	745	756	767	778	790	801	812	823	834	845	856	867
950	649	660	671	682	693	704	715	726	737	748	759	770	781	792	803	814	825	836	847	858	869
1000	653	664	675	686	697	708	719	730	741	752	763	774	785	796	807	818	829	840	851	862	873

Air pressure (air density) at the fire position																					
FP	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780
below																					
MS																					
50	584	594	604	614	624	634	644	654	664	674	684	694	704	714	724	734	745	755	765	775	785
100	587	597	607	618	628	638	648	658	668	678	688	698	708	718	728	738	749	759	769	779	790
150	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
200	594	604	614	624	634	644	654	664	674	684	694	704	714	724	734	744	754	764	774	784	794
250	598	608	618	628	638	648	658	668	678	688	698	708	718	728	738	748	758	768	778	788	803
300	601	612	622	632	643	653	663	674	684	694	705	715	725	735	746	756	767	777	788	798	808
350	604	615	625	635	646	656	667	677	688	698	709	720	730	740	751	762	773	784	795	806	817
400	608	619	629	639	650	661	671	682	692	703	713	724	734	745	755	766	776	787	797	807	817
450	612	623	633	643	654	665	675	686	696	707	717	728	738	749	759	770	781	792	802	812	827
500	615	626	637	647	658	669	679	690	700	711	722	732	743	753	764	775	785	796	807	817	827
550	619	630	640	651	662	673	683	694	705	715	726	736	747	758	769	780	790	801	812	822	832
600	623	633	644	655	666	677	687	698	709	720	730	741	752	763	773	784	795	806	816	826	837
650	627	637	648	659	670	681	691	702	713	724	734	745	756	767	778	789	800	811	821	831	842
700	631	641	652	663	674	685	696	706	717	728	738	749	760	771	782	793	804	815	825	836	847
750	634	645	656	667	678	689	700	711	722	733	743	754	765	776	787	798	809	820	830	841	852
800	638	649	660	671	682	693	704	714	725	737	747	759	770	781	791	803	814	825	836	846	857
850	642	653	664	675	686	697	708	718	730	741	752	763	775	785	796	808	819	830	840	851	862
900	645	657	668	679	690	701	712	723	734	745	756	767	778	790	801	812	823	834	845	856	867
950	649	660	671	682	693	704	715	726	737	748	759	770	781	792	803	814	825	836	847	858	869
1000	653	664	675	686	697	708	719	730	741	752	763	774	785	796	807	818	829	840	851	862	873

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CORRECTION SIGN

Cor- rection	Factor affecting the flight of the projectile		Mode of affecting	Cor- rection sign
Deflection	Drift		Deflection to the right	-
	Lateral wind	From left	Deflection to the right	-
		From right	Deflection to the left	+
	Cant of the cradle of trunnion	Right wheel lower	Deflection to the right	-
		Left wheel lower	Deflection to the left	+
Range	Longitudinal wind	From the front	Reduces the range	+
		From the back	Increases the range	-
	Air temperature	Higher than 15°C	Increases the range	-
		Lower than 15°C	Reduces the range	+
	Atmospheric pressure	Higher than normal	Reduces the range	+
		Lower than normal	Increases the range	-
	Muzzle velocity	Greater than normal	Increases the range	-
		Smaller than normal	Reduces the range	+
	Powder temperature	Higher than normal	Increases the range	-
		Lower than normal	Reduces the range	+
	Weight of the projectile	Greater than normal	Affects in dif- ferent ways	Stated in the column
		Smaller than normal		

PART IX

REMINDER FOR THE FIRING OPERATOR

A — PREPARATION FOR INDIRECT FIRING

1. Location of the base piece is determined according to the computed angle of site of the defilade (s), which is computed against the formula:

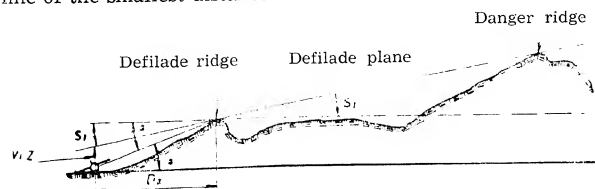
$$s = T - T(Dz + 200) \pm S$$

where:

T = angle of elevation of the topographic range of the most unfavourable point on the line of the smallest distance;

T (Dz + 200) = angle of elevation of the topographic distance of the defilade ridge increased by 200 m;

S = angle of site of the most unfavourable point on the line of the smallest distance.



Drwg. 1

2. Defilade height in meters (ViZ) for 76 mm weapons is minimum 8 meters, and for 105 mm weapons is minimum 12

meters. When firing by night, without the charge for reduction of flame, the ViZ would be increasing by 1,5—2 times. The ViZ is computed against the following formula, whenever possible to measure the S_1 from the ridge:

$$ViZ = Dz (s - S_1)$$

where:

ViZ = defilade height in meters;
Dz = distance from the battery to the ridge of the defilade in km;
 s = angle of site of the defilade measured from the location of the weapon or ridge of the defilade;
 S_1 = angle of site of the danger ridge measured from the defilade ridge.

Computation of ViZ when S_1 cannot be measured from the defilade ridge is graphically made, according to the data taken from the map as follows:

The variation in altitude of the firing position (VP = FE) defilade ridge and danger ridge is determined from the map.

— A horizontal line is drawn on a paper and the distance from the weapon to the defilade ridge and from the defilade ridge to the danger ridge is plotted on it in arbitrary proportion.

— From the place of the weapon, from the defilade ridge projection and danger ridge, lines perpendicular to the horizontal line are drawn and metric scales are inserted on them in appropriate relation.

— On the perpendicular line of the defilade ridge and danger ridge their variations in altitudes in relation to the weapon are plotted.

— The points thus obtained are connected by the line which is extended to the point of intersection with the perpendicular line from the weapon location and the defilade height is read off on that perpendicular line (Drwg. 2).

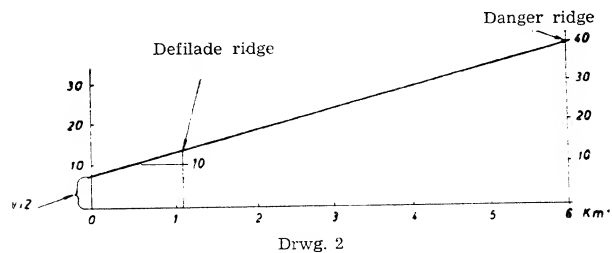
3. **Determination of the minimum elevation.** The minimum elevation can be calculated according the formula:

$$E_{min} = s + T (Dz + 200)$$

The angle of site of the defilade (s) is measured by means of the weapon or instrument. Angle of elevation (E) for the

distance to the defilade ridge increased by 200 m is taken from the Firing table for the charge selected.

4. **Quick preparation of the initial elements¹⁾.** Prior to assigning the firing mission, the weapon is laid in the initial position (OP), Drwg. 3 and the length of the base (B) determined.



¹⁾ The procedure described herein is applicable to the Aiming circle PB-1 and weapon supplied with panoramic telescopes where the figures indicating divisions on the azimuth scale increase in counter-clockwise direction.

Initial direction (OP) is that direction passing through the center of the zone of fire and targets. It is expressed by means of the azimuth in rounded up hundreds of mils being given to all the weapons and instruments of the artillery group.

The procedure for laying the weapon in initial direction (Drwg. 3) is as follows:

— The aiming circle is placed at least 30—50 m from the weapon and prepared for operation;

— On the aiming circle azimuth scale the initial direction is set (considering the correction too).

The scale and micrometer are set with 0-00 to match the index (black scale).

By rotating the monocular of the aiming circle, sight (mark) on the panoramic telescope of the weapon.

The angle is read off on the scale and micrometer (on the black scale).

The angle read off is ordered to the weapon;

— Sight on the aiming circle with the angle ordered.

This operations is repeated 2—3 times (depending on the time available) for elimination of the errors involved by the displacement of the panoramic telescope when sighting on the aiming circle.

meters. When firing by night, without the charge for reduction of flame, the Viz would be increasing by 1.5—2 times. The Viz is computed against the following formula, whenever possible to measure the S_1 from the ridge:

$$Viz = Dz (s - S_1)$$

where:

Viz = defilade height in meters;

Dz = distance from the battery to the ridge of the defilade in km;

s = angle of site of the defilade measured from the location of the weapon or ridge of the defilade;

S_1 = angle of site of the danger ridge measured from the defilade ridge.

Computation of Viz when S_1 cannot be measured from the defilade ridge is graphically made, according to the data taken from the map as follows:

The variation in altitude of the firing position ($VP = FE$) defilade ridge and danger ridge is determined from the map.

— A horizontal line is drawn on a paper and the distance from the weapon to the defilade ridge and from the defilade ridge to the danger ridge is plotted on it in arbitrary proportion.

— From the place of the weapon, from the defilade ridge projection and danger ridge, lines perpendicular to the horizontal line are drawn and metric scales are inserted on them in appropriate relation.

— On the perpendicular line of the defilade ridge and danger ridge their variations in altitudes in relation to the weapon are plotted.

— The points thus obtained are connected by the line which is extended to the point of intersection with the perpendicular line from the weapon location and the defilade height is read off on that perpendicular line (Drwg. 2).

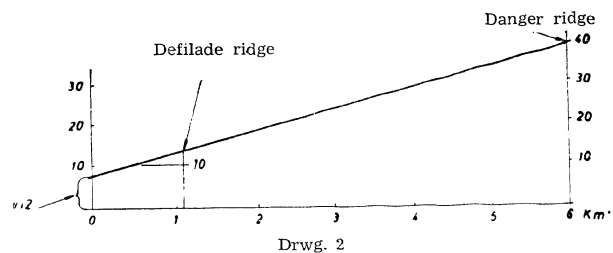
3. Determination of the minimum elevation. The minimum elevation can be calculated according the formula:

$$E_{min} = s + T (Dz + 200)$$

The angle of site of the defilade (s) is measured by means of the weapon or instrument. Angle of elevation (E) for the

distance to the defilade ridge increased by 200 m is taken from the Firing table for the charge selected.

4. Quick preparation of the initial elements¹⁾. Prior to assigning the firing mission, the weapon is laid in the initial position (**OP**), Drwg. 3 and the length of the base (**B**) determined.



¹⁾ The procedure described herein is applicable to the Aiming circle PB-1 and weapon supplied with panoramic telescopes where the figures indicating divisions on the azimuth scale increase in counter-clockwise direction.

Initial direction (**OP**) is that direction passing through the center of the zone of fire and targets. It is expressed by means of the azimuth in rounded up hundreds of mils being given to all the weapons and instruments of the artillery group.

The procedure for laying the weapon in initial direction (Drwg. 3) is as follows:

— The aiming circle is placed at least 30—50 m from the weapon and prepared for operation;

— On the aiming circle azimuth scale the initial direction is set (considering the correction too).

The scale and micrometer are set with 0-00 to match the index (black scale).

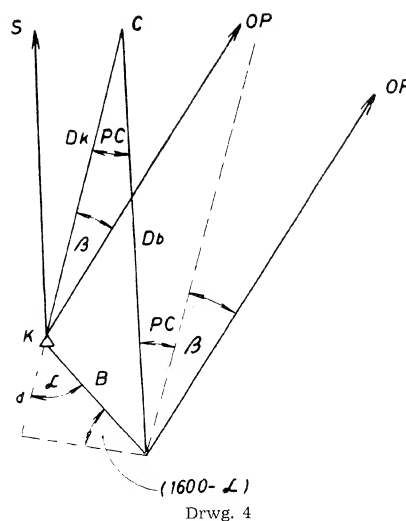
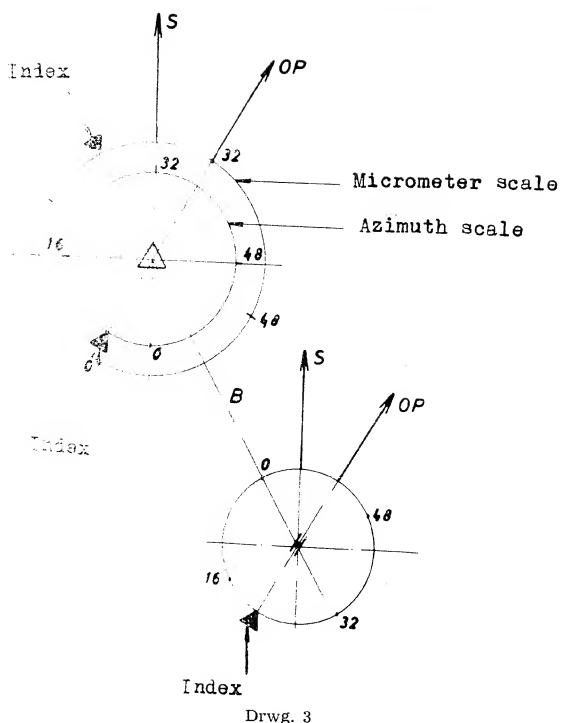
By rotating the monocular of the aiming circle, sight (mark) on the panoramic telescope of the weapon.

The angle is read off on the scale and micrometer (on the black scale).

The angle read off is ordered to the weapon;

— Sight on the aiming circle with the angle ordered.

This operations is repeated 2—3 times (depending on the time available) for elimination of the errors involved by the displacement of the panoramic telescope when sighting on the aiming circle.



— Deflection of the commander in range (d) visually or according to the formula:

$$d = B \sin (1600 - \alpha)$$

Distance: battery — target (Db), according to the formula:

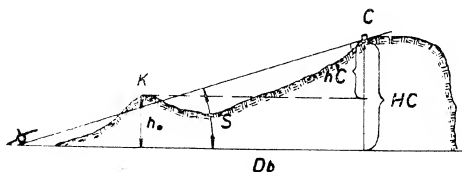
$$Db = Dk \pm d$$

— Parallax (PC) according to the formula:

$$PC = \frac{B \sin \alpha}{Db \text{ km}}$$

(The parallax is rounded up to the decreasing sense for a when you, having a «+» sign if the observation post is on the left and a «-» sign if it is on the right).

— Deflection from the OP to the battery, for the purpose of which the angle between the OP and target with appropriate signs and the target parallax should be added up.



Drwg. 5

Angle of site of the target, according to the formula:

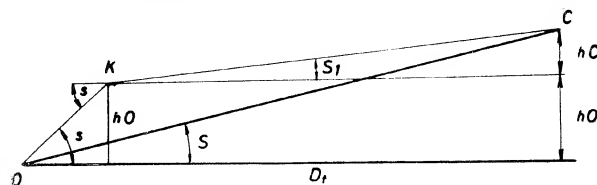
$$S = \frac{HCm}{Db \text{ km}}$$

where:

HC = surelevation of the target above the battery, being an algebraic sum of the surelevations of the observation post over the battery (hO) and surelevation of the target, above the observation post (hC).

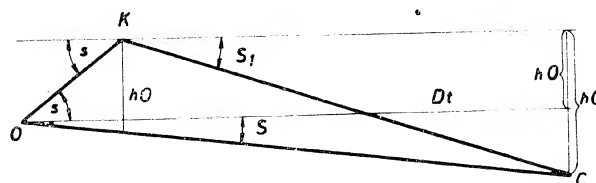
If the result obtained is greater than 25 mils, it is increased by 2%.

Various instances of determination of the angle of site:



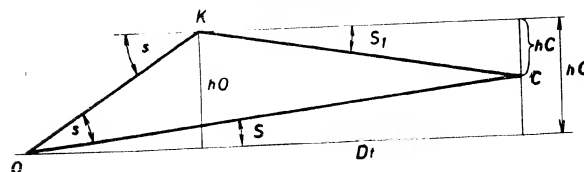
Drwg. 6

$$S = \frac{hC + hO}{Dt \text{ km}}$$



Drwg. 7

$$S = \frac{hC - hO}{Dt \text{ km}}$$



Drwg. 8

$$S = \frac{hO - hC}{Dt \text{ km}}$$

After giving the order to the battery, the following is computed:

— Coefficient of the distance (**KU**), according to the formula:

$$KU = \frac{Dk}{Db}$$

with an accuracy of 0,1 (if the **KU** is less than 0,3 with an accuracy of 0,01);

— Displacement of the azimuth scale (**SU**) for a bound in range of 100 m according to the formula:

$$SU = \frac{PC}{0,01 Db}$$

(Sign for **SU**: when increasing the distance the firing plane is placed and vice — versa).

5.

5. Abridged preparation of initial elements

Prior to assignment of the firing mission:

— The base piece and observation post are plotted on the map as well as the initial direction passing through these points.

— The altitude of the target is determined on the map.

After assignment of the firing mission:

— The target is plotted on the map (board).

— By measuring on the map (board), the deflection of the initial direction to the target is determined.

The topographic distance (range) of the target is measured on the map.

— The angle of site of the target is determined according to the formula:

$$s = \frac{\Delta Z}{DtC}$$

where:

ΔZ = surelevation of the target above the weapon;

DtC = firing distance, measured (if the obtained angle of site is exceeding 25 mils, it is increased by 2%).

— Corrections due to difference between actual and table firing conditions are approximately determined and recorded.

— The initial elements are determined.

— The coefficient of the distance (**KU**) and the azimuth displacement (**SU**) are determined and by a great parallax (above 5-00) — **MD** and **SU**.

(**MD** = coefficient by correction — see Drwg. 9).

6. Computation of ordinate of the trajectory

Approximate determination of the ordinate at any point of the trajectory, in low — angle fire is made according to the formula:

$$Yd = d (E - Td)$$

where:

Yd = ordinate sought; **d** = horizontal distance for which the ordinate is sought in km; **E** = angle of elevation for firing on the target; **Td** = elevation (table) for distance **d**.

7. Danger area for own troops

The danger area for own troops is determined according to the Table below:

Fire	Danger area in meters if infantry is of shelter		Remark
	In supine position	In prone position	
Front	6 Vd + 30	6 Vd + 15	Vd (Epr), Vp (Epd) are set for the appropriate charge and range.
Flank	6 Vp + 30	6 Vp + 15	

The size of the danger area on front slope is decreased to some extent, and increased on the rear one (parallelly with the increase, respectively decrease of the **Vd** and **Vp**). The danger area is increased when there is an obstacle to the trajectory of the projectile (tall trees etc) in the vicinity of own troops.

The danger area is practically assumed to be 400 m when the troops are in the open and 200 m when they are in shelters. Firing in the danger area is made only upon request or upon order of the infantry commander.

B — CORRECTION BY SENSING OF SHOTS

1. Correction by parallax up to 5-00

Correction is made with single bursts from the base piece up to starting of seeking of the last bracket. Seeking of the last bracket and resuming of correction is made by rapid fire with 2—3 shells in single-piece firing and with one shell per weapon in battery firing with such firing intervals enabling sensing of each burst.

Deflection correction consists of correction of the firing direction and arrangement of the sheaf.

The direction is good if the shots are in the observation line. After sensing of shots, its deflection is measured, multiplied by KU and the correction to the side of target ordered. The correction is determined with an accuracy up to 1 division of the micrometer scale. When it is between 0-20 and 1-00 it can be rounded up to the nearest five and when over 1-00 to the nearest ten.

The sheaf is arranged by deflection correction of each weapon separately or of the entire battery.

Range correction is made by enclosing the target within a bracket and sometimes (e.g. when firing in the vicinity of own troops) by drawing the shots nearer to the target.

By bracketing, the displacement on the range quadrant would be for:

- 4 first brackets after rapid preparation;
- 2 last brackets after abridged preparation or during visual firing transmission;
- 1 last bracket after complete preparation and during firing transmission on topographic base.

When the parallax exists, the displacement of the range quadrant would simultaneously involve the change of the azimuth, by the application of SU, for the purpose of maintaining the shots in the observation line. Thereby, by the increase in

range, the azimuth change is directed to the side of the battery (away from itself) and by the decrease to the side of the observation post (toward itself).

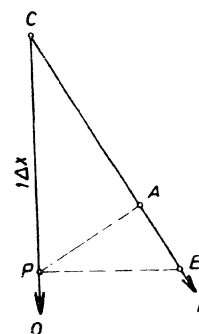
The bracket obtained is gradually splitted and the correction resumed after obtaining of the authorized last bracket or authorized mixed group, upon which group firing is proceeded.

2. Correction by parallax exceeding 5-00

For conducting correction, it is necessary to determine the coefficients MD and SU. This is performed graphically and by means of the formula:

$$MD = \frac{PA \text{ mm}}{Dk \text{ km}}$$

$$SU = \frac{PB \text{ mm}}{Db \text{ km}}$$



Drwg. 9

Correction procedure. After sensing the first shot, its deflection from the target is measured on the divisions of the azimuth scale and divided by MD, the result being rounded up to whole numerals of the range quadrant intervals, making the appropriate correction on the range quadrant and the subsequent projectiles is fired.

¹⁾ The last bracket is the one of a width of 4 Vd (table) practically being 50 or 100 meters, depending on the firing range, size of Vd etc.

The authorized bracket is the last bracket where at least 2 shots have been sensed on each limit.

²⁾ The authorized mixed group is a group of shots obtained under the same elevation in which the minus and plus relation is 2 : 2, 2 : 3, etc.

After the sensing of shots in range (in relation to the observation line, the azimuth is changed for 20 — 40 intervals with an aim of bracketing the target within the angular bracket.

By the azimuth change, such number of intervals is taken which can be divided by the SU. In order to maintain the shot within the observation line, the range quadrant is simultaneously changed with the change of the azimuth, by the application of MD, i.e.: if the azimuth change is taken to the side of the observation post, the range is decreased, and if to the opposite side, the range is increased.

After clearly sensing the shot on the other side of the target, the angular bracket is gradually splitted, simultaneously with the range bracket.

Up to enclosing of the target within the first angular bracket, the correction is made with single rounds, after which in bursts, in battery or platoon firing and with rapid fire of 2 rounds if firing from the weapon.

If all the shots of the bursts are of the same sense, the range quadrant is changed according to the variation of the mean shot from the target. If shots are on either side of the target and not sensed to range, the range quadrant is not changed.

The last angular bracket, when firing on live targets and firing points, shall not exceed 10 intervals of the azimuth and during demolition firing, maximum 5 intervals of the azimuth.

Transition to group firing is performed with the center of the last angular bracket, on the limits of which it is enough to have one securely sensed shot, respectively.

C — GROUP FIRING

1. Firing on infantry in motion.

Firing on infantry in motion is made with HE shell with superquick fuze (PD, M51A5) or with time fuze (MTSQ, M500A1) and on deep targets with ricochet, by impact of 2—4 shells and on immobilized targets with up to 6 shells per weapon. On ranges over 500 m the target is enclosed within a bracket of 100 or 200 m. When the target moves in range during group firing, the range quadrant is shifted by 50 to 200 meters (depending on the speed and course of the target). On ranges

to 500 meters the target is fired by shifting the aiming point to elevation.

2. Firing on cavalry and motocyclists is made with shell with superquick fuze (with minimum charge for the respective range) or with delay fuze for obtaining ricocheting, or with time fuze (How. 105 mm). Firing is made by impacts of 4 shells per weapon and on immobilized targets up to 6 shells per weapon.

The range quadrant and azimuth are shifted to the side of motion of the target (100 to 200 meters), and the azimuth scale according to the speed and course of the target.

3. Firing on live targets at rear slopes is made with:

- shell with superquick fuze;
- shell with delay fuze if ricocheting is required;
- shell with time fuze (How. 105 mm).

Firing with shell with superquick fuze is made by impacts of 2 shells per weapon, in bounds down slopes of 50 to 100 meters.

For the firing with projectile with time fuze such trajectory (charge) must be chosen which angle of fall is approximately equal to the angle max. or few smaller of the slope angle (—n). After firing adjustment on the ridge is finished, the firing is continued by displacement of the bursting points along the trajectory (by time changing for 0,2 — 0,4 sec.).

The number of springs (time changing) depends of the target wideness.

4. Firing on observed unsheltered live force and unsheltered firing points is made with shell with time fuze or delay fuze (for obtaining ricocheting) or with superquick fuze (if ricochet firing is not possible), minimum charge. Firing is made by impacts of 3—6 shells 76 mm per weapon or 2—4 shells 105 mm, alternately in bursts with appropriate firing intervals.

Ammunition expenditure per battery, after completed correction:

	Number of shells	
	76 mm	105 mm
By firing up 4 km	30 — 35	20 — 24
By firing up 4 km	45 — 52	30 — 36

5. Firing for destruction of live force in observed trenches.

Firing for destruction of sheltered live force in open trenches is made with shell with delay fuze, for obtaining ricocheting and if this is not possible, with superquick fuze. Firing on live targets in covered trenches is made with delay fuze, minimum charge.

Firing is conducted in rapid fire impacts alternately in bursts of 4—6 shells per weapon.

For 10 m long trenches (up to 3 km) by ricochet firing and by flank impact firing, 40 shells are required (duration of fire 15—25 minutes and by front firing with delay fuze with 60 shells; — duration of fire 20—40 minutes).

By firing over 3 km (up to 6 km) the ammunition expenditure is increased 1.5 times and by firing over 6 km — 2 times.

6. Neutralization of live force in observed trenches is made with shell with superquick fuze or with delay fuze (for obtaining ricocheting). Firing is made in volleys (2—4); in the meantime observation firing is performed. Volley firing: 2—4 shells with rapid fire, then methodical fire.

For trenches of 100 m length, 10 shells are required per minute for volley firing and 1/2 to 1 shell for observation firing.

Number of overs by front and cross ricochet firing shall be 1/3 to 1/2 and with delay fuze 1/2 to 2/3.

7. Neutralization of unobserved live force and firing means off shelters is made with shells with superquick and delay fuze (for obtaining ricocheting). If covered shelters occur in the firing area, half of the shells are ejected with delay fuze, by impact firing.

Firing is made in volleys — (2—4)) in the meantime observation firing is performed in intervals or without them. 10—12 shells per ha and minute for volley firing are required and 1—2 shells for observation firing. The area is uniformly fired at in bounds of 2—3 Vd. Sheaf of fire for effect.

8. Neutralization of unobserved live force and firing means off shelters is made with shell with superquick fuze or delay fuze (for obtaining ricocheting) by firing impacts which are repeated if reverse action of the target is observed.

48 shells 76 mm or 32 shells 105 mm are required per ha during one firing impact.

9. Direct firing with single weapon

a) Firing on immobilized targets is made with shell and fuze corresponding to the character of the target.

When first observation is obtained, a bracket of 100 m is sought (if the distance to the target is 1500 m (or 200 m) if distance to the target is over 1500 m). The bracket may be smaller or deeper, depending on the size of the deviation.

When a hit into the target is obtained or in close vicinity thereof, group firing with the same range quadrant is performed. Group firing is performed also with the range quadrant for the center of bracket of 100 m, on the limits of which one hit has been surely observed.

If in group firing the sign relation less than 3 : 1 is obtained, firing is resumed with the same range quadrant and in rapid fire.

When the number of hits of one sign is greater than the opposite one by 3 times at least, or if all hits are of the same sign the range quadrant is shifted for 50 m or the sighting point is changed and firing resumed.

b) Firing on tanks. When firing tanks (height of appr. 2 m) the size of the sweeping range is 300—400 m and the maximum firing range 1000 meters.

The scale and micrometer are set to 32-00, and the initial range setting according to the sensed range.

The lead is determined according to the angle of course of the tank moving toward the weapon, speed of motion of the tank and time of flight of the projectile on the respective range.

The lead is taken:

In silhouettes — By cross motion of the tank at a speed of 25 km/h (half of its silhouette if the angle of the course is 15—30° and 1 silhouette if the angle of course is 31—60°).

— In mils (on the panoramic telescope); by cross motion of the tank at a speed over 25 km/h and lateral motion of tank at any speed. The size of the lead in mils is determined according to this Table (see page 128) — applicable for muzzle velocity of the projectile of 400 m/sec. and less.

When the head is in silhouettes, sighting on half a silhouette (1 silhouette) is made in front of the tank on the direction of movement.

When the lead is in mils sighting is made on the front edge of the tank.

Deflection corrections:

— When the deviation of the burst is small (up to 0-05) the sighting point is changed for half a silhouette to the opposite side.

— When the deviation of the burst is great the azimuth is changed to the appropriate side and same sighting point is sighted.

Movement of tank	Angle of course of the tank	Velocity of movement km/h	Lead in mils
Crows	15°—30°	30	12
		35	14
		40	16
	31°—60°	30	18
		35	21
		40	24
Lateral	61—90°	10	8
		15	12
		20	16
		25	20
		30	24
		35	28
		40	32

Range corrections:

— When the tank is in sweeping range, the sighting point is changed to the appropriate side (higher or lower), for half of the height of the tank;

— When the tank is off the sweeping range new range quadrant setting is taken without changing the sighting point.

By front movement of the tank the center of the tank base is sighted.

D — TABLE OF FIRING RATE, EFFECT OF SHELL AND AMMUNITION EXPENDITURE

1. Table of technical firing rate for the mean charge:

Time of duration of firing		1	3	5	10	15	30	Next 30' to 3 h	3 h	Next 30' to 6 h	6 h
		minutes									
Number of shell per weapon	76 mm	20	40	50	55	68	110	53	375	37—38	600
	105 mm	8	18	24	36	48	84	43	300	27	460

Between two intervals for which the firing rate is specified in the table, it is considered that the rate is uniform, e.g. for 25 minutes the weapon 76 mm can fire with the mean charge:

$$68 + \frac{(110 - 68)}{15} \cdot 10 = 68 + \frac{42}{15} \cdot 10 = 96 \text{ shells.}$$

2. Effect of shell on open targets:

— **Powerful action** (hitting 90% of targets at the surface):

	76 mm	105 mm
— in the front	8 m	12 m
— in depth	5 m	8 m

— **Effective action** (hitting 50% of targets at the surface):

	76 mm	105 mm
— in the front	30 m	45 m
— in depth	15 m	20 m

— Number of injurious fragments ~ 200 — 250.

3. Effect of 76 mm shell with delay fuze on medium hard ground:

Dimensions of the funnel: dia 0,8 — 1 m
depth 0,3 — 0,5 m.

4. Average expenditure of shells by neutralization of battery per 1 ha:

Duration of neutralization per ha		1;2	1	2	3	4	Per each hour over 4 hours
Number of rounds	76 mm	72	96	144	180	204	24
	105 mm	48	64	96	120	136	16

5. Firing for destruction of a unprotected (out of the shelter) battery (of 4 weapons).

Expenditure of shells per battery (after completed correction):

Range km	76 mm	105 mm
4	288	128
6	480	192
8	—	352

6. Expenditure of shells for NZV stationary barrage fire:

a) for 76 mm: 6 shells in rapid fire and 10 bursts per weapon (a total of 64 shells per battery);

b) for 105 mm: 4 shells in rapid fire and 6 bursts per weapon (a total of 40 shells per battery);

7. For smoke screening of individual immobilized points when the wind speed is 5 m/sec, 2 shells per minute shall be fired from each weapon. If the wind speed is 6—7 m/sec, the number of shells is increased by 50—60%.

E — ABBREVIATIONS USED IN THE TABLES

α	— angle between line: commander-target and direction to the base piece
$\alpha_{\pi c}$	— azimuth of target
$\alpha_{\pi w}$	— azimuth of wind
AMS	— artillery meteo-station
β	— angle between the initial direction and target
B	— base
C	— target
CU	— volume
clb	— caliber
C	— probability factor
d	— horizontal distance
deflection	— deflection of the commander in range
delay	— delay action
Dft	— drift
Dk	— distance commander-target
Dz	— distance from the battery to the defilade ridge
Db	— distance battery-target
Dt	— topographical range
E	— angle of elevation
E_{\min}	— minimum elevation
F	— fork
FP	— firing position (VP)
Fs	— fuze setting
Ft	— feet
H	— air pressure (barometric)
HC	— surelevation of the target above the battery
hc	— surelevation of the target above the observation post

hO — surelevation of the observation post over the battery
 HE — high-explosive
 Lb — livres
 m — meter
 M — model
 MD — coefficient by correction
 MV — muzzle velocity (V_0)
 + n — front slope
 - n — rear slope
 N — normal weight
 NCD — nitrocellulose powder
 NZV — stationary barrage fire
 OP — initial direction
 PB-1 — aiming circle
 PD — point detonating fuze
 P_{max} — maximum pressure of powder gases
 P — weight of the projectile
 PC — parallax of the target
 $P\%$ — percentage of hits
 pS — correction for angle of site
 R — range
 RDX — hexogen
 S — angle of site
 S_1 — angle of site of the danger ridge
 s — angle of site of the defilade
 SU — displacement of the azimuth scale
 SQ — superquick action
 T — table angle = E of the topographic range
 T — trinitrotoluene (TNT)
 T — superquick (SQ)
 Td — elevation (table) for distance d
 TV — factory
 TB — factory
 t^0 — temperature of air
 t^0p — t^0b = temperature of powder
 TNT — trinitrotoluene
 TF — time of flight
 @ — angle of fall
 U — delay action

V_0 — muzzle velocity (MV)
 Vd — probable error range (epd)
 Vp — probable error deflection (epd)
 Vv — probable error height (eph)
 ViZ — defilade height
 VP — firing position (FP)
 V θ — terminal velocity
 Z — surelevation of the target above the weapon
 WT — weight (W)
 W-D — lateral wind (Wy)
 W-R — rear wind (Wx)
 Wy — lateral wind (W-D)
 Wx — rear wind (W-R)
 Ys — maximum ordinate
 Yd — ordinate sought
 /000 — mils

Note:

For the angle which is being set on the sighting device during sighting the target the term «Azimuth» was used.

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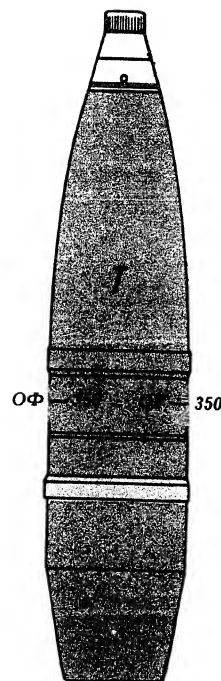


Fig. 1 — HE, SHELL
OΦ — 350 or OF — 350 (HE)



Fig. 3 — HE, SHELL M 55

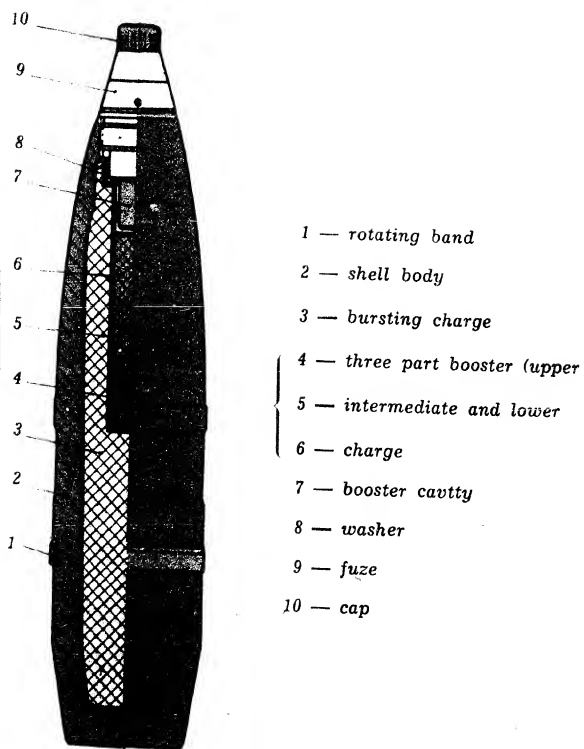


Fig. 1a — HE, SHELL OΦ — 350 or OF — 350 (HE)
 w/Fuze KTM—1

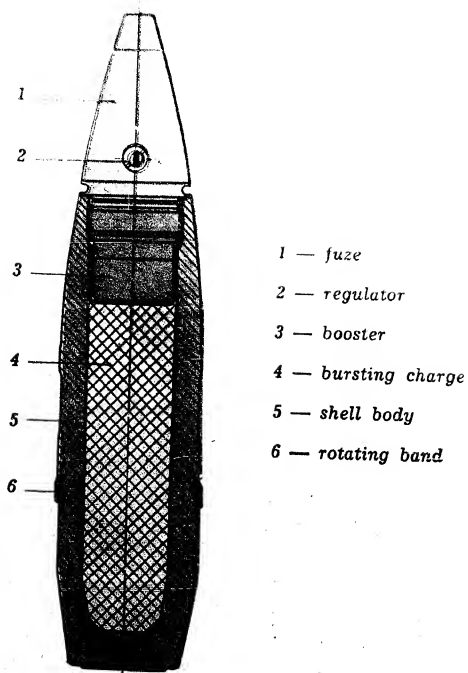
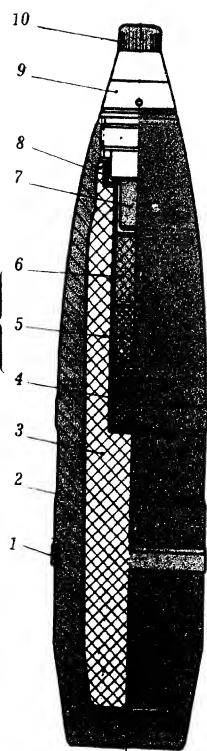
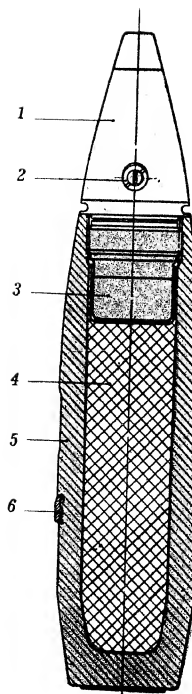


Fig. 3a — HE, SHELL M 55 w/FUZE UTU M51A5 .05 sec



- 1 — rotating band
- 2 — shell body
- 3 — bursting charge
- 4 — three part booster (upper)
- 5 — intermediate and lower
- 6 — charge
- 7 — booster cavity
- 8 — washer
- 9 — fuze
- 10 — cap

Fig. 1a — HE, SHELL OΦ — 350 or OF — 350 (HE)
w/Fuze KTM—1



- 1 — fuze
- 2 — regulator
- 3 — booster
- 4 — bursting charge
- 5 — shell body
- 6 — rotating band

Fig. 3a — HE, SHELL M 55 w/FUZE UTU M51A5 .05 sec

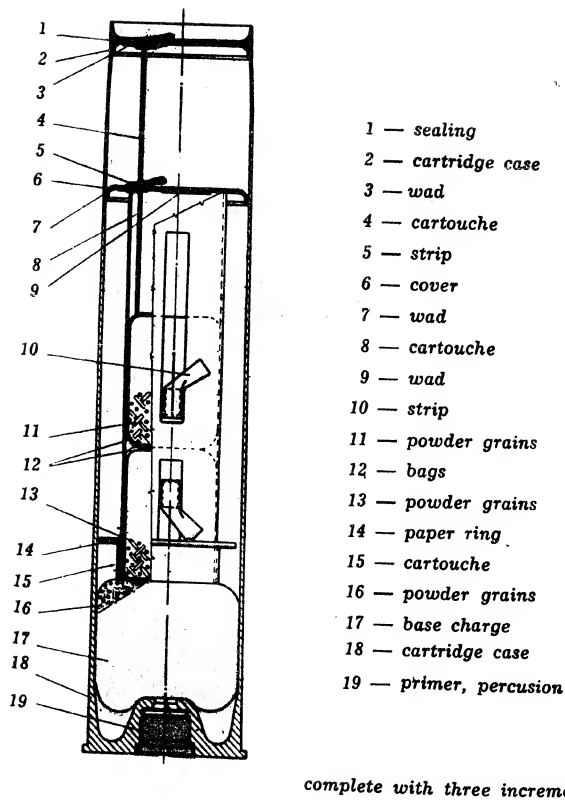


Fig. 2 — CARTRIDGE CASE, HE, SHELL Φ O—350 or OF—350 (HE) and HE, SHELL M 55

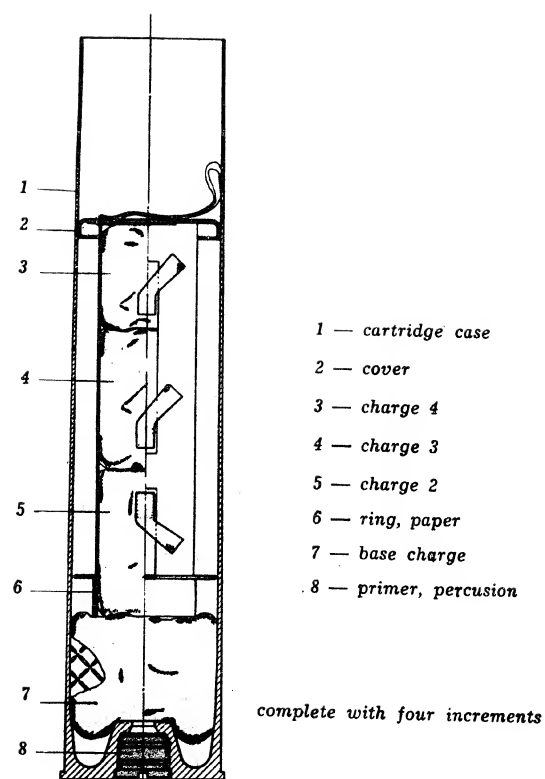


Fig. 3b — CARTRIDGE CASE, HE, SHELL Φ O—350 or OF—350 (HE) and HE, SHELL M 55

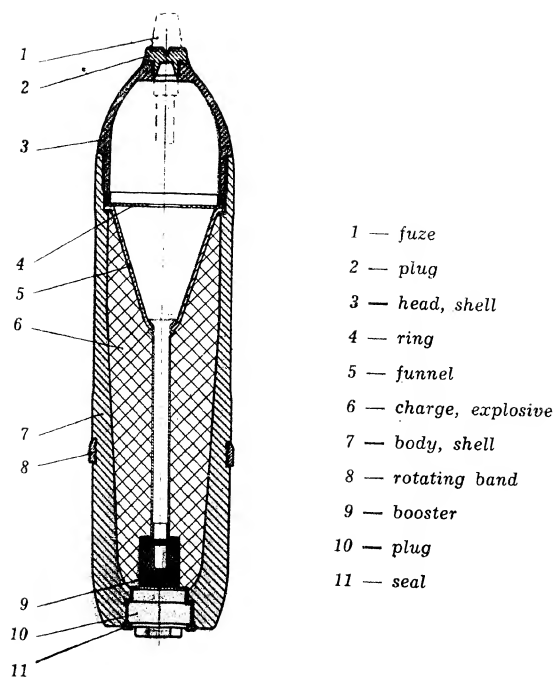


Fig. 4 — HE, AT, SHELL BP — 350/2 or BP — 350/2

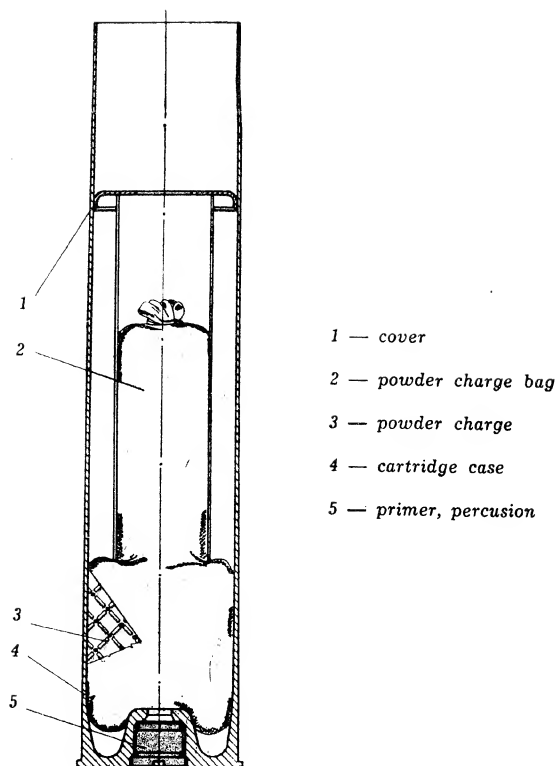


Fig. 5 — CARTRIDGE CASE, HE, AT, SHELL BP — 350/2

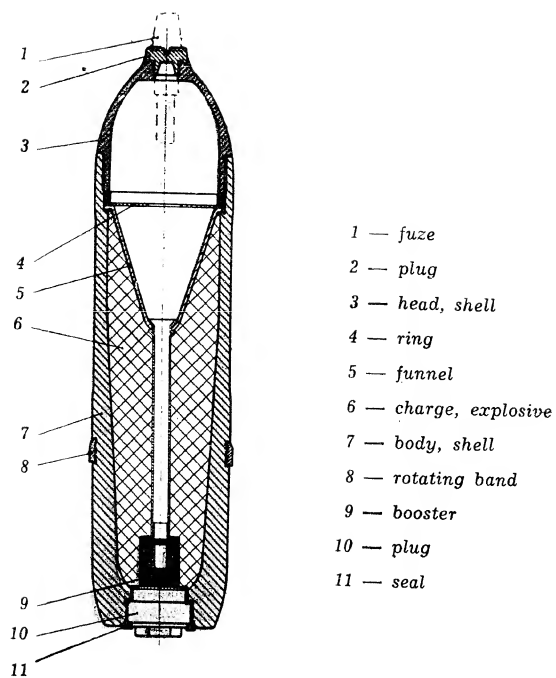


Fig. 4 — HE, AT, SHELL BII — 350/2 or BP — 350/2

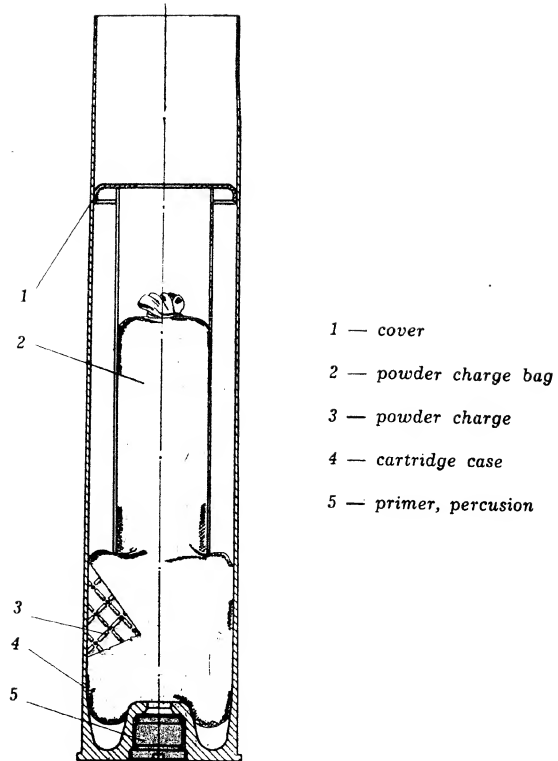
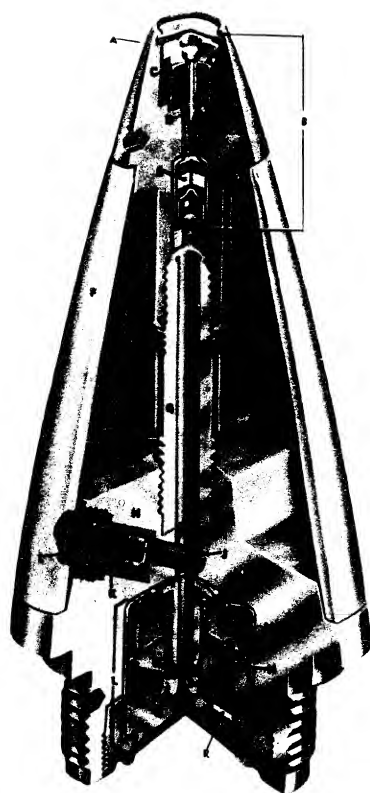
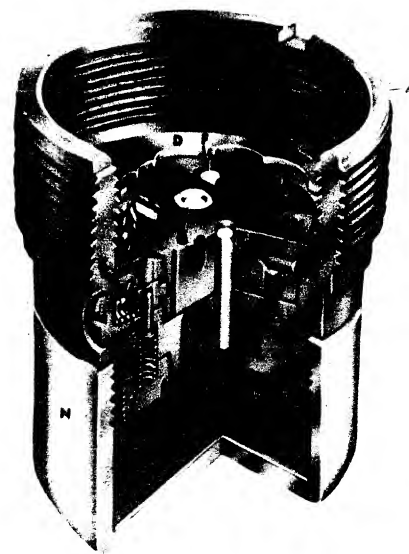


Fig. 5 — CARTRIDGE CASE, HE, AT, SHELL BP — 350/2



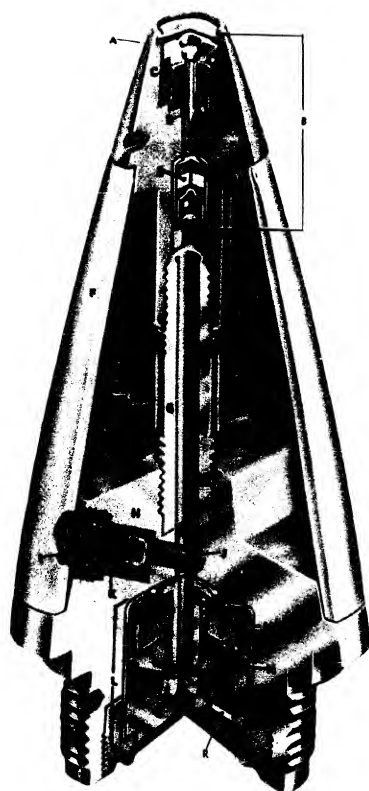
- A — head
- B — superquick element
- H — body
- L — plunger assembly
- G — flash tube
- F — tin-waled ogive
- D — firing pin
- C — cup
- E — detonator
- M — firing pin
- N — primer
- O — delay pellet
- R — relay charge
- J — plunger
- K — plunger spring
- I — setting sleeve
- Q — plunger pins
- P — plunger pin lock

Fig. 6 — FUZE, PD, UTU M51A5 .05 sec for HE, SHELL M 55



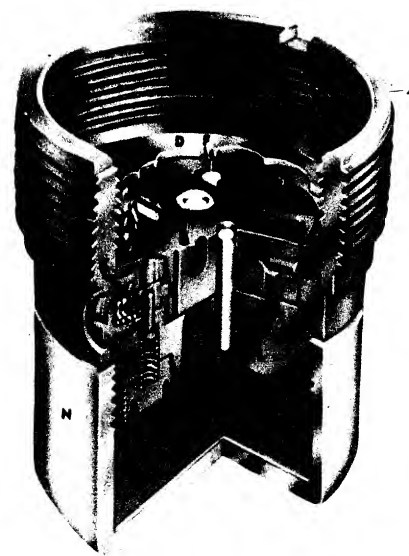
- N — booster cup
- O — booster charge
- A — threaded brass
- M — booster lead
- H — rotor
- G — detonator
- K — centrifugally actuated pin
- P — pin lock pin
- F — rotor stop pin
- I — rotor lock pin
- J — rotor lock pin lok
- L — pivot pin
- D — cover
- E — disk of paper

Fig. 6 — BOOSTER for FUZE, PD, UTU M51A5 .05 sec



- A — head
- B — superquick element
- H — body
- L — plunger assembly
- G — flash tube
- F — tin-waled ogive
- D — firing pin
- C — cup
- E — detonator
- M — firing pin
- N — primer
- O — delay pellet
- R — relay charge
- J — plunger
- K — plunger spring
- I — setting sleeve
- Q — plunger pins
- P — plunger pin lock

Fig. 6 — FUZE, PD, UTU M51A5 .05 sec for HE, SHELL M 55



- N — booster cup
- O — booster charge
- A — threaded brass
- M — booster lead
- H — rotor
- G — detonator
- K — centrifugally actuated pin
- P — pin lock pin
- F — rotor stop pin
- I — rotor lock pin
- J — rotor lock pin lok
- L — pivot pin
- D — cover
- E — disk of paper

Fig. 6 — BOOSTER for FUZE, PD, UTU M51A5 .05 sec

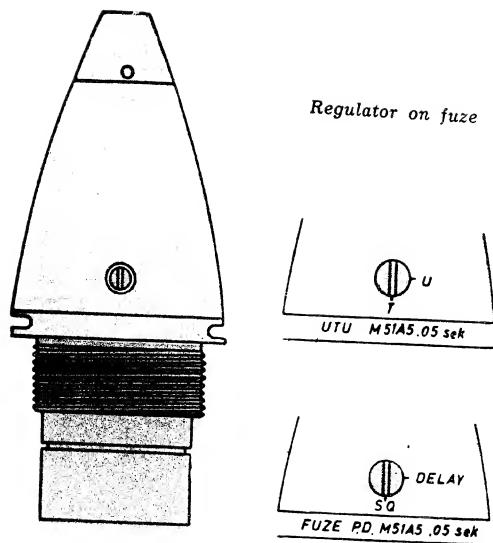


Fig. 6a — FUZE, PD, M51A5 .05 sec for SHELL M 55

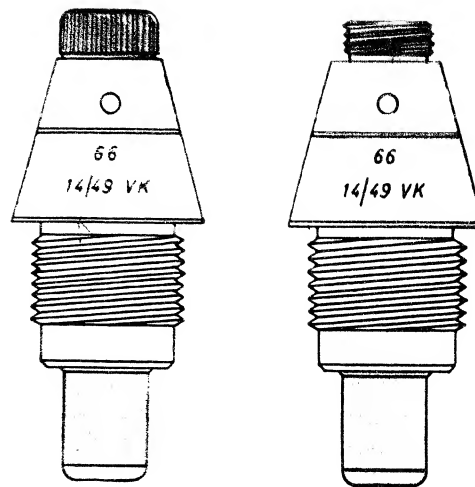


Fig. 7 — FUZE, PD, KTM-1 for SHELL OF — 350

- cap on (delay action)
- cap off (superquick action)



Fig. 8 — FUZE, PD, K-451 for
HE, AT, SHELL BP-340/2

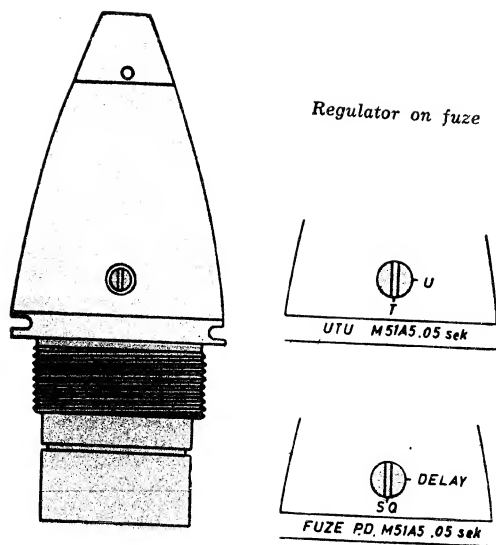


Fig. 6a — FUZE, PD, M51A5 .05 sec for SHELL M 55

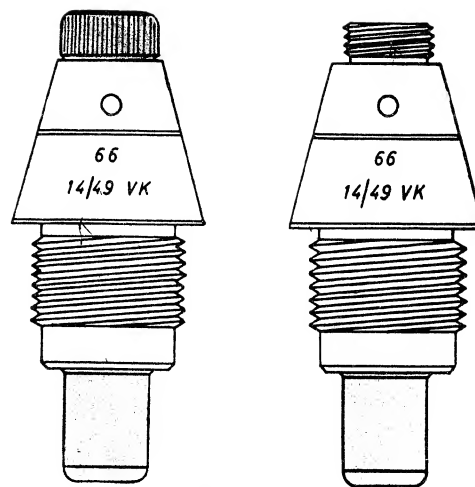


Fig. 7 — FUZE, PD, KTM-1 for SHELL OF-350 (HE)

- cap on (delay action)
- cap off (superquick action)

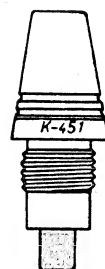
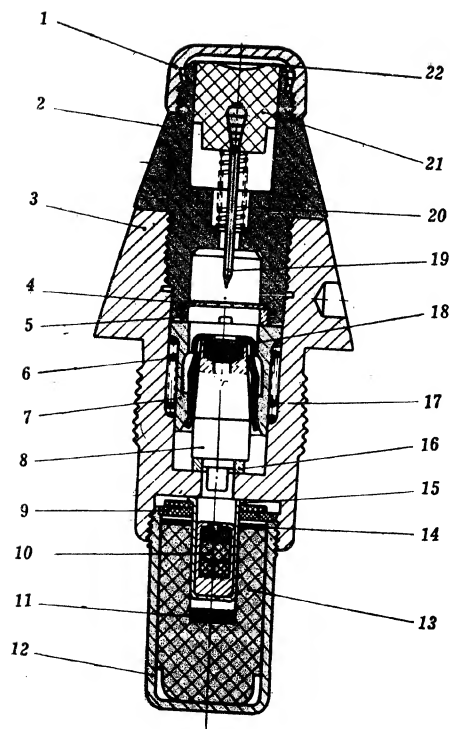


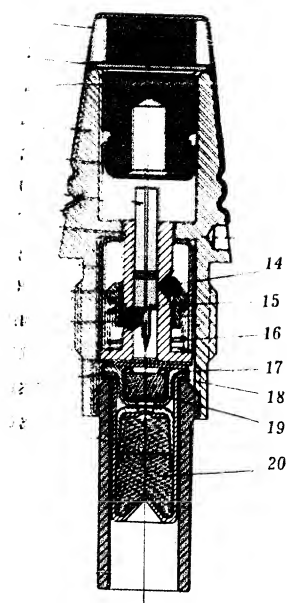
Fig. 8 — FUZE, PD, K-451 for HE, AT, SHELL BP-350/2



- 1 — cap
- 2 — head
- 3 — body
- 4 — safety counterstar
- 5 — locking ring
- 6 — sleeve spring
- 7 — sleeve
- 8 — striker
- 9 — felt wads
- 10 — detonator
- 11 — felt wad
- 12 — booster cup
- 13 — booster
- 14 — felt wad
- 15 — detonator holder
- 16 — seal ring
- 17 — safety sleeve
- 18 — primer
- 19 — firing pin
- 20 — safety spring
- 21 — firing pin head
- 22 — closing disc

Fig. 7a — FUZE, PD, KTM—1 for HE, SHELL OF — 350 (HE)

Fig. 7a — FUZE, PD, KTM—1 for HE, SHELL OF — 350 (HE)



- 1 — cap
- 2 — shear wire
- 3 — striker
- 4 — fuze body
- 5 — striker cap
- 6 — impact element
- 7 — sleeve
- 8 — cap-shaped support
- 9 — safety sleeve
- 10 — ball
- 11 — resistance washer
- 12 — closing cap
- 13 — flash tube
- 14 — ball
- 15 — firing pin
- 16 — spring
- 17 — detonator holder
- 18 — washer
- 19 — detonator
- 20 — booster



- 22 — factory
- 35 —
- 4695 — projectiles
- 45 —

- 35 — 14 —
- hardness test

Fig. 2a — FUZE, PD, K-451 for HE, SHELL BP-350/2

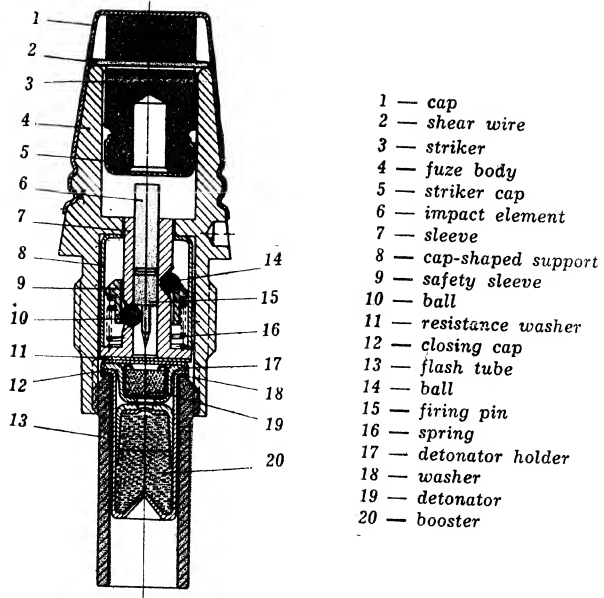
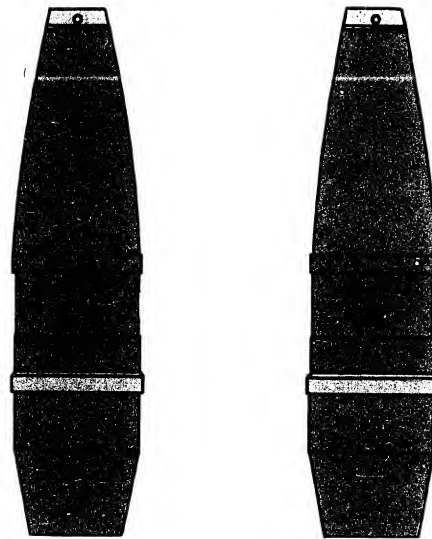
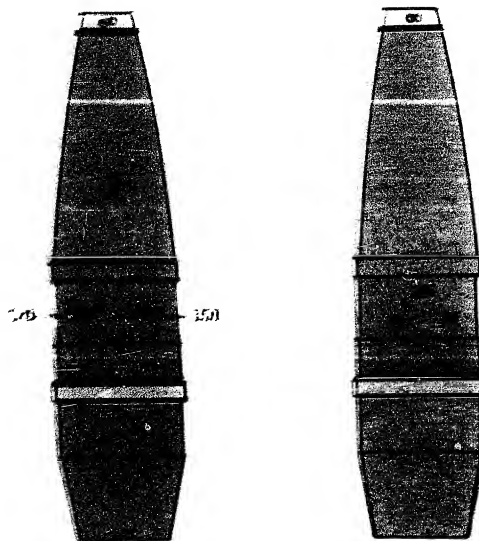


Fig. 8a — FUZE, PD, K-451 for HE, SHELL BP-350/2



- 22 — factory
 35 — lot
 4695 — number of projectiles
 45 — year of manufacture
 35 — 14 — lot of material
 □ — hardness test
 ○△ — inspector's mark

Fig. 9 — STAMPING ON HE, SHELL



T — kind of filler (TNT)
OP — 350 or OF — 350
— type and model of shell
HE — high-explosive
76 — caliber of weapon
H or N — weight-zone (normal)

Fig. 10 — MARKING ON HE, SHELL

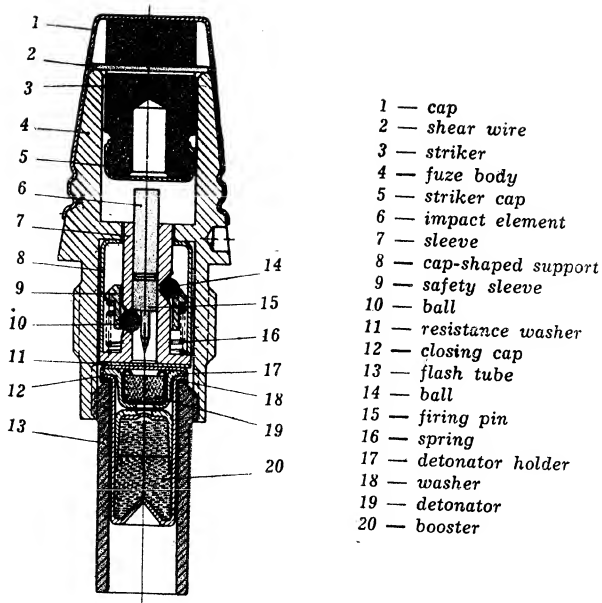


Fig. 8a — FUZE, PD, K-451 for HE, SHELL BP-350/2

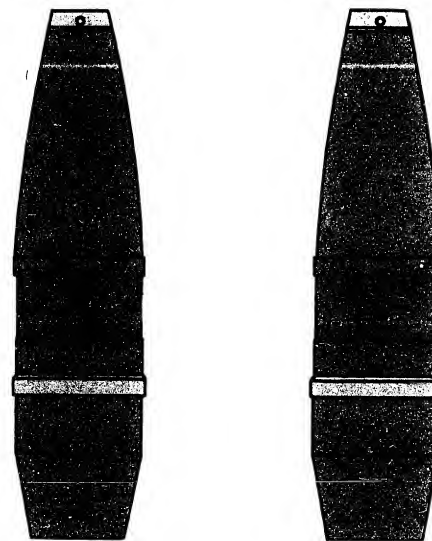
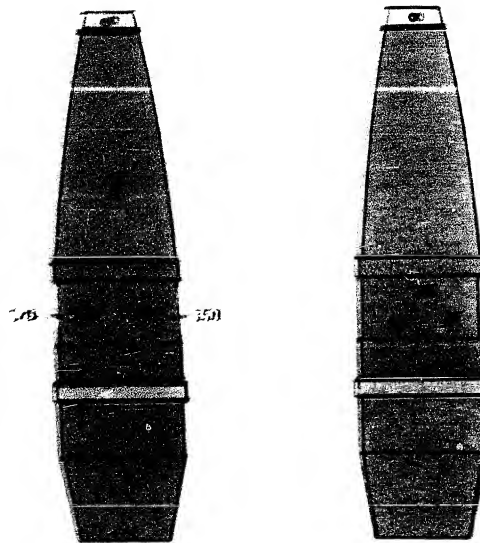
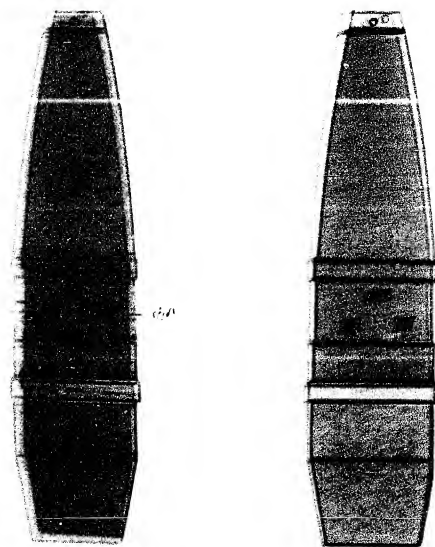


Fig. 9 — STAMPING ON HE, SHELL



T — kind of filler (TNT)
 350 — 350 or OF — 350
 — type and model of shell
 HE — high-explosive
 75 — caliber of weapon
 H or N — weight-zone (normal)

Fig. 10 — MARKING ON HE, SHELL



1. Length of shell (mm)
 2. Weight of shell (g)
 3. Type and method of shell
 4. High explosive
 5. Caliber of weapon
 If "N" weight zero (normal)

Fig 10 MARKING ON HR, SHELL

Restricted

MOUNTAIN GUN

76 mm M 48 B1, B1A1, B1A2, B1A3 and B1A4

BOOK III

NOMENCLATURE

50X1-HUM

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INTRODUCTION

1. SCOPE

The book TS III, 76 mm Mountain Gun M 48 B1, B1A1, B1A2, B1A3 and B1A4 Nomenclature contains all data concerning component part of this weapon and should be used by the ordnance personnel for identification, storage and issue purposes. In addition to weapon component parts the list includes accessories and special tools required for use and maintenance of the weapon.

The weight data given in column 7 of the Nomenclature may be used for all requirements of planning, transportation and storage purposes. It should be kept in mind that the given weights are net weights, and the weights of preservation means and packing are not included.

2. EXPLANATION OF SYMBOLS AND REFERENCES

Column 1 - INDEX - in the Nomenclature is used as a register of producer internal references and a register of nomenclature numbers of same parts.

Column 2 - BASIC UNIT NUMBER - contains the mark of the basic unit /for example B 102/ and part number /for example 11003/ and serves for evidence, storage and demand of parts.

Column 3 - PRODUCER INTERNAL REFERENCE - contains the reference according to which the respective part is manufactured. It is used to find the corresponding part and to order parts from the producer. For more expedient identification of parts when only the producer internal references are known a register of producer internal references is attached as an appendix.

Column 4 - DEMONSTRATION - the weapon component parts are listed according to assemblies, subassemblies and parts. The weapon is divided in assemblies representing a physical and functional unit /for example, mantle with handle brake/ and such assemblies into subassemblies according to functional relation which also represent a physical and functional unit /for example, mantle/ or only a functional unit/ for

example, breechring lock/.

In certain cases the assemblies do not have subassemblies. This is rather for important major parts /for example, barrel/.

The names of the parts are written step-wise to the right so that the name for the assembly and subassembly is written in capital letters and for the part the most characteristic noun is written in capital letters until the remaining descriptive words are written in normal small letters. Exceptionally certain small subassemblies where the component parts can not be disassembled or normally are not disassembled are listed as a part, and the component parts of these are given in the forth step /for example, grease cup/.

When a part is not used for all weapon models, but only for a determined model, then at the end of the denomination of such part, in particular, it is written to which model the part pertains /for example, only for B1A1/. If complete assemblies differ or a number of parts differ in the same, characteristic for an other model, then, the complete assembly is listed separately with a note to which model it pertains.

Column 5 - UNIT - is given depending of the kind of material as: pieces, sets, meters, etc.

Column 6 - QUANTITY OF PARTS PER ASSEMBLY OF THE WEAPON - shows the quantity of respective parts built - in a assembly respectively a subassembly. If a part is built in two or more assemblies respectively subassemblies then such part has a assembly nomenclature number respectively subassembly nomenclature number where it appeared for the first time. Such parts are marked X in Column 9 of the Nomenclature. The register of nomenclature numbers of same parts shows in how many assemblies respectively subassemblies such part appears and number of the same built in the weapon. The quantity of parts per assembly - subassembly of the weapon represents at the same the quantity of the respective parts in the complete weapon if the same are not marked with X in the note and are not entered in the register of nomenclature numbers of same parts.

Column 7 - WEIGHT OF PARTS PER UNIT IN KGS - This column gives the data about net weights of parts in kgs, without the weight of preservation and packing.

Column 8 - FIGURE No - gives the number of the figure in the Nomenclature, where the part can be seen.

Column 9 - NOTE - The parts which reappear in more assemblies respectively subassemblies are marked with X in this column. Also other remarks important for certain nomenclature items are written in this column.

3. ABBREVIATIONS AND SYMBOLS

The following abbreviations and symbols are used in this book:

ABBREVIATION	MEANING
Ø	diameter
Ø 10/Ø 8	Ø 10 = outer dia, Ø 8 = inner dia
mm	millimeter
m	meter
kg	kilogram
pcs	pieces
set	set /assembly/
lgt	length
wid	width
h	height
th	thickness
ph	pitch
max	maximum
min	minimum
st	steel
cop	copper
rub	rubber
sh	sheet
alum	aluminum
bz	bronze
dim	dimension

SYMBOLS

X the part reappear in several assemblies or subassemblies. The register of nomenclature numbers of same parts shows where the part

8

- reappears and the quantity per complete weapon,
- WS weapon set /weapon spare parts, tools and accessories/.
- BS 2 Battery set - box No 2 / spare parts, tools and accessories/.

4. DIFFERENCES BETWEEN WEAPON MODELS

The main design differences between particular model done in the course of manufacture of the 76 mm mountain guns M 48 B1 are the following:

76 mm MOUNTAIN GUN M48 B1

These weapons are manufactured according to the original design and no changes in construction are carried out on the same.

76 mm MOUNTAIN GUN M48 B1A1

The 76 mm mountain gun M 48 B1A1 differs from the basic weapon model /B1/ as follows:

1. Breech block

- The round opening for the hammer in the breechblock /Blo2-14001/ is slotted on one end under an angle of 90° /to prevent turning of the hammer, and for larger facing surface for the sear;
- The firing pin /Blo2-14101/ with semi-round point is replaced with a new firing pin /Blo3-14101/ with a flat point.
- The striker /Blo2-14107/ is replaced with a new striker /Blo3-14107/ shaped according to the slot on breechblock body
- The following parts are omitted: striker plate /Blo2-14105/; striker plate screw safety spring /Blo2-14103/; striker plate support /Blo2-14106/ and screw M 7x1, striker plate fastener /Blo2-14109/.
- A modification is performed on the following parts: trigger lever shaft for firing over lanyard /Blo2-14524/; auxiliary trigger with triggering shaft /Blo2-14515/; trigger lever for triggering over lanyard /Blo2-14516/; handle for movement of the breechblock with circular case and guide of the brake spring /Blo2-14614/ and link of the spring for opening the breechblock /Blo2-14615/.

9

2. Recoil mechanism

The counter piston rod /Blo2-18302/ and recoil length regulator /Blo2-15008/ is redesigned.

3. Hydro pneumatic recuperator

- The recoil length regulator nut /Blo2-17804/ is redesigned.
- The following is added to the recoil length regulator: the ring for the recuperator liquid filling valve nut /Blo3-17814/; nut M 22x1,2 mm for the recuperator liquid filling valve /Blo3-17805/.

4. Shields

- The bottom shields are shortened.
- The top shield brackets and top shield bracket bushes /Blo2-34601/ are reinforced.
- Two shield supports, left and right, complete /Blo3-34700/ are added.

MOUNTAIN GUN 76 mm M48, B1A2

Includes all changes characteristic for weapon B1A1 and the following:

- On the bottom carriage, a new spring with coil spring and semi-axle, right /Blo4-28000/ and left /Blo4-29000/ is mounted.
- A new wheel with semi-elastic tyre, right /B416-15100/ and left /B416-16100/ is mounted.
- Two complete, left and right supports /Blo3-34700/ are added.

MOUNTAIN GUN 76 mm M48, B1A2

Includes all changes characteristic to weapon B1A1 and the following:

- On the bottom carriage a new spring with coil spring and semi-axle is mounted, right /Blo4-28000/ and left /Blo4-29000/.
- A new wheel with semi-elastic tyre is mounted, right /B416-15100/ and left /B416-16100/.
- The width of the bottom shield wings is decreased /for 32,5 mm/, right /Blo2-34103/ and left /Blo2-34201/.

10

d/ The sealing of the recuperator free piston with a leather lining Blo2-1771o is replaced with a rubber sealing Blo4-1771o.

e/ The hydraulic liquid steel MJ is replaced with steel MM

MOUNTAIN GUN 76 mm M48, B1A3

Includes all changes characteristic to weapon B1A2 and the following:

a/ The top carriage body /Blo2-1500o/ is redesigned and replaced with a new /lighter/ top carriage body /Blo5-1500o/.

b/ In the hydraulic brake, and recuperator redesign of rubber sealings and all metal parts which are in connection with the sealing system, is performed. This redesign is introduced on the weapons from number 31o3.

The redesigned parts are as follows: recuperator cylinder sealing /Blo5-171o5/; recuperator piston, body /Blo5-172o2/; nut M 18x1,5 ring, recuperator sealing /Blo5-172o3/; sealing ring /Blo5-172o6/; recuperator piston sealing /Blo5-172o8/; nut M 36x1,5 mm, recuperator cylinder sealing case sealing ring /Blo5-175o3/; nut M 36x1,5 mm recuperator cylinder sealing case /Blo5-175o4/; recuperator cylinder sealing case sealing ring /Blo5-175o5/; recuperator cylinder sealing case sealing /Blo5-175o7/; recuperator hydrogen filling hole plug sealing /Blo5-176o9/; free piston, body /Blo5-177o2/ nut M 26x1 mm, free piston sealing ring /Blo5-177o3/; sealing ring /Blo5-177o8/; free piston sealing /Blo5-1771o/; recuperator liquid filling hole plug /Blo5-178o1/; nut M 36x1,5 mm, sealing ring /Blo5-178o2/; nut M 42x1,5 mm, regulator valve /Blo5-178o6/; regulator sealing ring /Blo5-17813/; recoil regulator, body /Blo5-17816/; recoil regulator sealing /Blo5-175o7/; recuperator liquid filling valve nut sealing /Blo5-17819/; recuperator liquid filling hole plug sealing /Blo5-1782o/; regulator valve nut sealing /Blo5-17821/; nut M 38x1,5 mm, sealing ring /Blo5-184o4/; brake sealing case sealing /Blo5-182o8/; brake sealing ring /Blo5-185o3/; brake sealing case sealing /Blo5-177o9/; plug T brake liquid filling valve hole /Blo5-186o1/; plug T sealing for the brake liquid filling valve hole /Blo5-1861o/; compensator piston, body /Blo5-187o3/; compensator piston sealing ring /Blo2-1871o/; compensator piston sealing /Blo5-177o9

c/ The sear /Blo2-141o8/ and the pusher pawl for recocking

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/Blo2-14211/ is modified.

MOUNTAIN GUN 76 mm M48, B1A4

Includes all changes characteristic for weapon B1A3 except the following:

a/ The wheels are with pneumatic tyres Blo3-3000o and Blo3-3100o on which the parts are redesigned: wheel limb, rim and limb cap. The new parts are marked Blo6-320o2; Blo6-320o1 and Blo6-320o3.

5. SIGHTING DEVICE

The following sighting devices pertain to the Mountain Gun 76 mm M48, B1A1, B1A2, B1A3:

- Range quadrant DE-1
- Panoramic telescope M 57 or panoramic telescope SG M1
- Gunners quadrant M 5o
- Lighting accessory PO-Z

NOMENCLATURE

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
	B1o2 B1o3 B1o4 B1o5 B1o6		Mountain gun 76 mm M48 B1 Mountain gun 76 mm M48 B1A1 Mountain gun 76 mm M48 B1A2 Mountain gun 76 mm M48 B1A3 Mountain gun 76 mm M48 B1A4				1-7	
			I. BARREL, BREECHING, HANDLE, MUZZLE BRACE AND BREECHBLOCK				8	
			11000 - BARREL					
1	B1o2-11000	A112-19986	BARREL	set	1	77,000	9	
2	B1o2-11001	A114-19115	EYE, barrelcarrying front	pcs	1	0,057		
3	B1o2-11002	A114-23874	EYE, barrel carrying rear	pcs	1	0,130		
4	B1o2-11003	A111-19987	BARREL BODY	pcs	1	66,600		
5	B1o2-11004	A114-19116	PIN Ø 10x28, front and rear eye	pcs	2	0,017		
6	B1o2-11005	A114-29125	FORK, M 20x1,5, rear eye	pcs	1	0,080		
7	B1o2-11006	A114-19114	SCREW, M 4, length 8 mm, front and rear eye pin fastening	pcs	2	0,001		
8	B1o2-11007	A114-19992	SCREW, M 5, length 10 mm rear eye fork fastening	pcs	1	0,002		
			12000 - BREECHING					
9	B1o2-12000	A111-19526	BREECHING	set	1		10	
10	B1o2-12001	A994-1015	SLIDER, breechring right bronze	pcs	1	0,300		
11	B1o2-12002	A994-1015	SLIDER, breechring left bronze	pcs	1	0,300		
12	B1o2-12003	B4-19469	LUBRICATOR, composed of 1 spring 1 Ball 1 Lubricator body	pcs	2	0,003	12	X
13	B1o2-12004	114-2792	EYE, M 16, breechring carrying and artificial recoil	pcs	1	0,210	10	
14	B1o2-12005	114-19538	PLATE, right buffing copper	pcs	1	0,070		
15	B1o2-12006	A114-19531	PLATE, left buffing copper	pcs	1	0,070		
16	B1o2-12007	A110-19550	BREECHING BODY	pcs	1	48,600	10	
17	B1o2-12008	A994-1176	SCREW, M 6x1, slide special bronze	pcs	6	0,005		X
18	B1o2-12009	A114-29023	SCREW, M 10, quadrant plane extension bronze	pcs	1	0,070		
19	B1o2-12010	A114-29029	SCREW, M 5, quadrant plane extension bronze safety	pcs	1	0,002		
20	B1o2-12011	A114-29055	SCREW, M 4, length 11 mm, quadrant plane cheese-headed stop	pcs	4	0,002		

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
21	B1o2-12o12	A114-19527	SCREW, M 8, length 12 mm, buffing plate cheese-headed	pcs	4	0,006		
22	B1o2-121oo		BREECHRING LOCK	set	1			
23	B1o2-121o1	993-1o64	LOCK, body /with bolt A114-279o	pcs	1	0,845	1o	
24	B1o2-121o2	A114-19548	PIN, Ø 6x25 mm, lock bolt eye, taper	pcs	2	0,004		
25	B1o2-121o3	994-1o13	PIN, Ø 3x2o mm, lock shaft, taper	pcs	1	0,002	1o	
26	B1o2-121o4	A114-2789	SPRING, Ø 1o Ø 8, length 32, Ø of wire 1 mm, breechring lock	pcs	1	0,002	1o	
27	B1o2-121o5	A994-1o65	SHAFT, breechring lock	pcs	1	0,113	1o	
28	B1o2-121o6	A114-19547	EYE, breechring lock bolt	pcs	2	0,05o		
29	B1o2-122oo		BARREL AND CRADLE LINK	set	1			
30	B1o2-122o1	A114-28o7	PIN, Ø 2,5x15 mm, link fastening bolt head	pcs	1	0,002	1o	
31	B1o2-122o2	A114-2799	HEAD, link crank lever fastening bolt	pcs	1	0,024	1o	
32	B1o2-122o3	A114-2797	BOLT, link crank lever fastening	pcs	1	0,009	1o	
33	B1o2-122o4	A114-2798	SPRING, Ø 11/Ø 9, length 13,5, Ø of wire 1 mm link cranklever fastening bolt	pcs	1			
34	B1o2-122o5	A114-2793	SHAFT, link gear	pcs	1	0,039	1o	
35	B1o2-122o6	A113-23858	CONNECTING RACK, link	pcs	1	0,572	1o	
36	B1o2-122o7	A114-161o9	CRANK LEVER, link	pcs	1	0,125	1o	
37	B1o2-122o8	114-29465	SCREW, M 1o x1, link connecting rack stop	pcs	1	0,008	1o	
38	B1o2-122o9	A114-28o1	SCREW, M 16x1,5, link gear shaft safety	pcs	1	0,011	1o	
39	B1o2-1221o	A114-2794	GEAR, link spur	pcs	1	0,036	1o	
			13ooo - MANTLE WITH MUZZLE BR KE					
4o	B1o2-13ooo	A112-1972o	MANTLE WITH MUZZLE BRAKE	set	1		11	
41	B1o2-131oo		MANTLE	set	1			
42	B1o2-131o1	114-2oo62	SLIDE, length 42o mm, mantle front, right, bronze	pcs	1	0,35o		
43	B1o2-131o2	114-2oo62	SLIDE, length 42o mm, mantle front left, bronze	pcs	1	0,35o		
44	B1o2-131o3	114-2oo63	SLIDE, length 46o mm, mantle rear, right, bronze	pcs	1	0,45o		
45	B1o2-131o4	114-2oo63	SLIDE, length 46o mm, mantle rear, left bronze	pcs	1	0,45o		
46	B1o2-12oo3	B4-19469	LUBRICATOR composed of: 1 Spring 1 Ball 1 Lubricator body	pcs	4	0,002	12	X

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
21	B1o2-12o12	A114-19527	SCREW, M 8, length 12 mm, buffing plate cheese-headed	pcs	4	0,006		
22	B1o2-121oo		BREECHRING LOCK	set	1			
23	B1o2-121o1	993-1o64	LOCK, body /with bolt A114-279o	pcs	1	0,845	1o	
24	B1o2-121o2	A114-19548	PIN, Ø 6x25 mm, lock bolt eye, taper	pcs	2	0,004		
25	B1o2-121o3	994-1o13	PIN, Ø 3x2o mm, lock shaft, taper	pcs	1	0,002	1o	
26	B1o2-121o4	A114-2789	SPRING, Ø 1o Ø 8, length 32, Ø of wire 1 mm, breechring lock	pcs	1	0,002	1o	
27	B1o2-121o5	A994-1o65	SHAFT, breechring lock	pcs	1	0,113	1o	
28	B1o2-121o6	A114-19547	EYE, breechring lock bolt	pcs	2	0,05o		
29	B1o2-122oo		BARREL AND CRADLE LINK	set	1			
3o	B1o2-122o1	A114-28o7	PIN, Ø 2,5x15 mm, link fastening bolt head	pcs	1	0,002	1o	
31	B1o2-122o2	A114-2799	HEAD, link crank lever fastening bolt	pcs	1	0,024	1o	
32	B1o2-122o3	A114-2797	BOLT, link crank lever fastening	pcs	1	0,009	1o	
33	B1o2-122o4	A114-2798	SPRING, Ø 11/Ø 9, length 13,5, Ø of wire 1 mm link cranklever fastening bolt	pcs	1	0,002	1o	
34	B1o2-122o5	A114-2793	SHAFT, link gear	pcs	1	0,039	1o	
35	B1o2-122o6	A113-23858	CONNECTING RACK, link	pcs	1	0,572	1o	
36	B1o2-122o7	A114-161o9	CRANK LEVER, link	pcs	1	0,125	1o	
37	B1o2-122o8	114-29465	SCREW, M 1ox1, link connecting rack stop	pcs	2	0,008	1o	
38	B1o2-122o9	A114-28o1	SCREW, M 16x1,5, link gear shaft safety	pcs	1	0,011	1o	
39	B1o2-1221o	A114-2794	GEAR, link spur	pcs	1	0,036	1o	
			13ooo - MANTLE WITH MUZZLE BRAKE					
4o	B1o2-13ooo	A112-1972o	MANTLE WITH MUZZLE BRAKE	set	1		11	
41	B1o2-131oo		MANTLE	set	1			
42	B1o2-131o1	114-2oo62	SLIDE, length 42o mm, mantle front, right, bronze	pcs	1	0,35o		
43	B1o2-131o2	114-2oo62	SLIDE, length 42o mm, mantle front left, bronze	pcs	1	0,35o		
44	B1o2-131o3	114-2oo63	SLIDE, length 46o mm, mantle rear, right, bronze	pcs	1	0,45o		
45	B1o2-131o4	114-2oo63	SLIDE, length 46o mm, mantle rear, left bronze	pcs	1	0,45o		
46	B1o2-12oo3	B4-19469	LUBRICATOR composed of: 1 Spring 1 Ball 1 Lubricator body	pcs	4	0,002	12	X

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
47	Blo2-131o5	11o-2oo54	MANTLE BODY	pcs	1	51,5oo	12	X
48	Blo2-12oo8	A994-1176	SCREW, M 6x1, slide special bronze	pcs	16	o,oo6		
49	Blo2-132oo		FRONT SIGHT-ROUGH	set	1			
5o	Blo2-132o1	A114-19723	FRONT SIGHT	pcs	1	o,oo3	12	
51	Blo2-132o2	A114-19448	SUPPORT, front sight	pcs	1	o,oo6o	12	
52	Blo2-132o3	A114-19436	SCREW, M 5, front sight support fastening	pcs	1	o,oo2	12	
53	Blo2-133oo		RECOIL LENGTH RULE	set	1			
54	Blo2-133o1	A113-19716	RULE, with scale from 3oo up to 9oo mm recoil length steel	pcs	1	o,359	12	
55	Blo2-133o2	A114-19814	WASHER, rule	pcs	5	o,oo2	12	
56	Blo2-133o3	A114-19717	SCREW, M 5, length 18 mm, rule fastening cheese-headed	pcs	2	o,oo3	12	
57	Blo2-133o4	A114-19718	SCREW, M 5, length 17 mm, rule fastening countersunk	pcs	3	o,oo3	12	
58	Blo2-134oo		RECOIL LENGTH INDICATOR	set	1			
59	Blo2-134o1	A114-23884	SPRING, recoil length index leaf	pcs	1	o,ool	12	
6o	Blo2-134o2	A114-23854	INDICATOR BODY, recoil length brass	pcs	1	o,oo56	12	
61	Blo2-134o3	A114-19715	RIVET, Ø 3x8, indicator spring copper	pcs	1	o,ool	12	
62	Blo2-135oo		MUZZLE BRAKE	set	1			
63	Blo2-135o1	A111-19721	MUZZLE BRAKE BODY	pcs	1	17,5oo	11	
64	Blo2-135o2	A114-13o1	SCREW, M 12x1,75, length 22 mm, muzzle brake fastening	pcs	2	o,ol3	11	
65	Blo2-14ooo		14ooo - BREECHBLOCK					
			BREECHBLOCK	set	1			
66	Blo2-14ool	112-23861	BREECHBLOCK BODY /only for B1	pcs	1	14,ooo		
67	Blo3-14ool	B1-1o25o	BREECHBLOCK /for B1A1, B1A2, B1A3 and B1A4 /	pcs	1	14,ooo	13	
68	Blo2-141oo		FIRING PARTS	set	1			
69	Blo2-141o1	A994-328	FIRING PIN / only for B1/	pcs	1	o,ol6		
7o	Blo3-141o1	A994-328	FIRING PIN /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	o,ol6	14	
71	Blo2-141o2	A994-334	SPRING Ø 21/Ø15 mm length 77 mm Ø of wire 3 mm, firing	pcs	1		14	
72	Blo2-141o3	A994-332	LOCK WASHER, back plate screw /only for B1/	pcs	2			

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Notes
1	2	3	4	5	6	7	8	9
73	B1o2-141o4	A994-333	BACK PLATE	pcs	1	o,3oo	14	
74	B1o2-141o5	A994-329	STRIKER PLATE / only for B1/	pcs	1			
75	B1o2-141o6	A994-331	SUPPORT, striker plate / only for B1/	pcs	2			
76	B1o2-141o7	All4-3o0oo	STRIKER / only for B1 /	pcs	1			
77	B1o3-141o7	All4-29999	STRIKER /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	o,228	14	
78	B1o2-141o8	A994-1o86	SEAR /for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,262		
79	B1o5-141o8	A994-1o86A	SEAR /only for B1A3 up to No 31o3 and B1A4/	pcs	1	o,26o	17	
8o	B1o2-141o9	A994-33o	SCREW, M 7x1,5, striker plate fastening /only for B1/	pcs	2			
81	B1o2-142oo		RECOCKING HANDLE, BREECHBLOCK	set	1			
82	B1o2-142o1	All3-23887	CASING, recocking mechanism, with rough rear sight	pcs	1	o,228	15	
83	B1o2-142o2	A994-1o97	BUSHING, handgrip	pcs	1	o,o45	15	
84	B1o2-142o3	All4-28o6	PIN, Ø 4x25 mm, recocking ratchet	pcs	1	o,oo4	15	
85	B1o2-142o4	All4-28o8	PIN, Ø 5x38 mm, handgrip bushing	pcs	1	o,oo6	15	
86	B1o2-142o5	All4-28o5	PIN, Ø 7x55 mm, recocking handle	pcs	1	o,o17	15	
87	B1o2-142o6	A994-1o96	AXLE, handle	pcs	1	o,o31	15	
88	B1o2-142o7	A994-1411	SPRING, Ø 15,2/Ø 1o,4 mm length, 46,Ø of wire 2,4mm, ratchet torsion	pcs	1	o,o12	15	
89	B1o2-142o8	A994-11oo	SPRING, Ø 18,5/Ø 15,5, length 32, Ø of wire 1,5 mm, handle axle	pcs	1	o,oo5	15	
9o	B1o2-142o9	A994-1o95	LEVER, recocking handle	pcs	1	o,282	15	
91	B1o2-1421o	A994-1o98	HANDGRIP, recocking handle	pcs	1	o,o43	15	
92	B1o2-14211	All4-23883	RATCHET, recocking /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	o,o44	15	
93	B1o5-14211	994-1o99	RATCHET, recocking/ only for B1A3 from No 31o3 and B1A4/	pcs	1			
94	B1o2-143oo		EXTRACTING PARTS	set	1	o,287		
95	B1o2-143o1	All4-1938o	PIN, Ø 4x4o mm, extractor shaft lever	pcs	1	o,oo4	16	
96	B1o2-143o2	All4-3o2	EXTRACTOR, upper	pcs	1	o,287	16	
97	B1o2-143o3	All4-3o3	EXTRACTOR, lower	pcs	1	o,266	16	
98	B1o2-143o4	A993-36o	EXTRACTOR SHAFT	pcs	1	o,377	16	
99	B1o2-143o5	A994-338	LEVER, extractor shaft	pcs	1	o,125	16	
1oo	B1o2-144oo		EXTRACTOR SHAFT LOCK	set	1			
1o1	B1o2-144o1	A994-386	LOCK STOP, shaft	pcs	1	o,o15	16	
1o2	B1o2-144o2	A994-945	SPRING, Ø 15/Ø 11,4 mm, length 6o, Ø of wire 1,8 mm lock	pcs	1	p,o11	16	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
103	B1o2-144o3	A994-356	LOCK BOLT	pcs	1	0,078	16	
104	B1o2-145oo		TRIGGERING PARTS	set	1			
105	B1o2-145o1	A994-34o	BUSHING, trigger shaft lock	pcs	1	0,069	13	
106	B1o2-145o2	A114-19384	PIN, Ø 3x11 mm, trigger shaft lock bolt head taper	pcs	1	0,001	13	
107	B1o2-145o3	A114-19381	PIN, Ø 4x28 mm, trigger shaft lock bushing taper	pcs	1	0,004	13	
108	B1o2-145o4	A114-19379	PIN, Ø 4x2o mm, roller shaft taper	pcs	1	0,003	13	
109	B1o2-145o5	A114-19732	PIN, Ø 4x2o mm, trigger shaft lifter lever taper	pcs	1	0,003	18	
110	B1o2-145o6	A114-19734	PIN, Ø 3x2o mm, trigger shaft lifter lever pawl taper	pcs	1	0,002	18	
111	B1o2-145o7	A114-19733	PIN, Ø 4x25 mm, trigger shaft lifter pusher taper	pcs	1	0,003	19	
112	B1o2-145o8	A114-19735	PIN, Ø 6x6o mm, trigger shaft lifter spring retainer taper	pcs	1	0,009	19	
113	B1o2-145o9	A114-19375	HEAD, trigger shaft lock bolt, with eyelet	pcs	1	0,025	13	
114	B1o2-1451o	A114-2oo33	LIFTER, trigger shaft	pcs	1	0,148	19	
115	B1o2-14511	A114-19376	LOCK BOLT, trigger shaft	pcs	1	0,021	13	
116	B1o2-14512	A994-384	ROLLER, trigger shaft	pcs	1	0,03o	13	
117	B1o2-14513	A113-19946	CASING, TRIGGER AKXILIARY PARTS, BODY	pcs	1	0,33o	18	
118	B1o2-14514	A114-19932	NUT, M 8x1,25, lifter lever adjusting bolt	pcs	1	0,007	19	
119	B1o2-14515		HANDLE, auxiliary, with triggering shaft / only for B1/	pcs	1			
120	B1o2-14515	B4-8411	HANDLE, auxiliary; with triggering shaft /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	0,53o	19	
121	B1o2-14516	994-1145 994-1244	HANDLE, triggering, over lanyard, /only for B1/	pcs	1			
122	B1o3-14516	B4-8381 B4-8383	HANDLE, triggering, over lanyard, /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	0,155	18	
123	B1o2-14517	A994-354	TRIGGER	pcs	1	0,058	17	
124	B1o2-14518	A994-342	SPRING, Ø 12,7/1o,7, length 35, Ø of wire 1 mm, trigger shaft lock bolt	pcs	1	0,002	13	
125	B1o2-14519	A994-339	SPRING, Ø 21 ² / ₁₇ , 4, length 22, Ø of wire 2 mm trigger	pcs	1	0,007	17	
126	B1o2-1452o	A994-1146	SPRING, Ø 11,4/8,6, length 4o, Ø of wire 1,4 mm, trigger shaft lifter lever draw	pcs	1	0,005	18	
127	B1o2-14521	A994-1142	SPRING, Ø 11/9,4 length 22, Ø of wire 0,8 mm trigger shaft lifter lever pawl	pcs	1	0,001	18	

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
128	Blo2-14522	A994-1133	SPRING, Ø17,1/14,5, length 70, Ø of wire 1,3 mm trigger shaft lifter	pcs	1	0,007	19	
129	Blo2-14523	A994-358	SHAFT, roller	pcs	1	0,030	13	
130	Blo2-14524	A113-19731	SHAFT, trigger.handle, over lanyard /only for B1 /	pcs	1			
131	Blo3-14524	B4-8412	SHAFT, trigger.handle, over lanyard /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	0,085	18	
132	Blo2-14525	A994-1144	WASHER, trigger.casing screw elastic	pcs	4	0,001	18	
133	Blo2-14526	A993-335	TRIGGER lever	pcs	1	0,410	13	
134	Blo2-14527	A114-19729	LEVER, triggershaft lifter	pcs	1	0,071	18	
135	Blo2-14528	A994-1132	PUSHER, trigger shaft lifter	pcs	1	0,066	19	
136	Blo2-14529	A994-1134	RING, trigger shaftlifter spring spacing	pcs	1	0,111	19	
137	Blo2-14530	A114-19736	COTTER PIN, auxiliary triggering handle shaft, Ø 3,8x42 mm	pcs	1	0,002	23	
138	Blo2-14531	A994-385	SCREW, M 12x1,5, roller fastening special	pcs	1	0,024	13	
139	Blo2-14532	B4-13009	SCREW, M 4, length 10 mm, auxiliary triggering handlefastening	pcs	1	0,001		
140	Blo2-14533	A994-1143	SCREW, M8x1,25, length 23,8 mm, lifter lever adjusting	pcs	8	0,010	19	
141	Blo2-14534	A114-19737	SCREW, M 8x1,25, length 17 mm, triggering casing fastening	pcs	4	0,008	18	
142	Blo2-14535	A994-1137	PAWL, trigger shaft lifter lever	pcs	1	0,013	18	
143	Blo2-14600	A113-19383	BREECHBLOCK OPERATING PARTS	set	1			
144	Blo2-14601	A994-697	BUSHING, breechblock closing spring	pcs	1	0,512	20	
145	Blo2-14602	A114-19999	PIN, Ø 3,1x28, breechblock guide roller fastening screw taper	pcs	1	0,002	21	
146	Blo2-14603	A114-2864	KEY, breechblock operating shaft and breechblock opening spring connector	pcs	1	0,022	20	
147	Blo2-14604	A994-2710	LOCK, breechblock operating handle	pcs	1	0,275	22	
148	Blo2-14605	A994-383	ROLLER, breechblock guide	pcs	1	0,019	21	
149	Blo2-14606	A114-19994	NUT, M 15x1,5, breechblock operating shaft knurled	pcs	1	0,120	20	
150	Blo2-14607	994-616	SPRING, Ø 34,2/24, length 161,9 Ø of wire 5,1 mm, breechblock closing torsion	pcs	1	0,275	20	
151	Blo2-14608	994-615	SPRING, breechblock opening watch	pcs	1	0,532	21	
152	Blo2-14609	A994-2712	SPRING, Ø 13/10, length 37, Ø of wire 1,5 mm breechblock operating handlelock	pcs	1	0,004	22	
153	Blo2-14610	A113-19427	SHAFT, breechblock operating	pcs	1	1,210	20	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
154	B1o2-14611	A994-976	SHAFT, breechblock operating handle lock	pcs	1	0,007	22	
155	B1o2-14612	A113-2867	COVER, breechblock operating handle circular box	pcs	1	0,450	21	
156	B1o2-14613		RING, Ø 64,8/58, thickness 3,9 mm operating parts protecting felt	pcs	1		21	
157	B1o2-14614	992-2709	HANDLE, breechblock with circular box and lock spring guide operating A114-19425 /only for B1/	pcs	1			
158	B1o3-14614	922-2709	HANDLE, breechblock with circular box and lock spring guide operating, A114-19426 /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	1,500	21	
159	B1o2-14615	993-695	CONNECTOR, breechblock opening spring /only for B1 /	pcs	1			
160	B1o3-14615	A113-2866	CONNECTOR, breechblock opening spring /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	0,436	21	
161	B1o2-14616	A114-23204	SAFETY PIN, breechblock operating shaft nut	pcs	1	0,017	20	
162	B1o2-14617	A994-977	PIN, breechblock operating handle lock shaft	pcs	1	0,005	22	
163	B1o2-14618	A993-359	GUIDE, breechblock	pcs	1	0,808	21	
164	B1o2-14619	A994-355	SCREW, M 12x1,25, length 22 mm, roller guide fastening special	pcs	1	0,018	21	
165	B1o2-14700		SEMI-AUTOMATIC MECHANISM RETAINER	set	1			
166	B1o2-14701	A994-980	SPRING, Ø 13/10 length 26, Ø of wire 1,5 mm, semiautomatic mechanism retaining tooth	pcs	1	0,004	17	
167	B1o2-14702	A994-1150	GUIDE, Ø 9, length 20, semiautomatic mechanism retaining tooth spring	pcs	1	0,010	17	
168	B1o2-14703	A994-978	TOOTH, semiautomatic mechanism retaining	pcs	1	0,030	17	
169	B1o2-14800		OPERATING CAM, SEMIAUTOMATIC MECHANISM	set	1			
170	B1o2-14506	A114-19734	PIN, Ø 3, length 20, operating cam body fastening bolt head taper	pcs	1	0,001	23	X
171	B1o2-14801	A114-19730	HEAD, operating cam body fastening bolt knurled	pcs	1	0,031	23	
172	B1o2-14802	A994-1185	STOP PIN, Ø 8x15 mm, cam crank spring retaining ring	pcs	1	0,006		
173	B1o2-14803	A994-1153	BOLT, operating cam body fastening	pcs	1	0,006	23	
174	B1o2-14804	A994-1186	SPRING, Ø 23/17, length 70, Ø of wire 3, operating cam crank torsion	pcs	1	0,044	23	
175	B1o2-14805	A994-1152	SPRING, Ø 15/12, length 30, Ø of wire, 1,5, operating cam body fastening bolt	pcs	1	0,004	23	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Notes
1	2	3	4	5	6	7	8	9
176	B1o2-148o6	A994-1187	WASHER, ϕ 28/14,2, thickness 3 mm, operating cam crank	pcs	1	o,oll	23	
177	B1o2-148o7	A994-1189	RING, operating cam crank spring retaining	pcs	1	o,148	23	
178	B1o2-1453o	A114-19736	COTTER PIN, ϕ 3,8x42 mm, operating cam crank	pcs	1	o,oo4	23	X
179	B1o2-148o8	993-118o	CRANK, operating cam	pcs	1	o,569	23	
18o	B1o2-148o9	A112-2o155	OPERATING CAM BODY /only for B1/	pcs	1			
181	B1o3-1481o	B2-8413	OPERATING CAM BODY /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	3,67o	23	
II - CARRIAGE								
A. TOP CARRIAGE								
15ooo - TOP CARRIAGE								
182	B1o2-15ooo	A111-19699	TOP CARRIAGE /only for B1, B1A1 and B1A2/	set	1			
183	B1o5-15ooo	B1-22169	TOP CARRIAGE /only for B1A3 and B1A4/	set	1		24	
184	B1o2-15oo1	A113-23851	GUNNER PROTECTOR	pcs	1	o,7oo	28	
185	B1o2-15oo2	B4-42o2	PIN, ϕ 3x23, lock bolt stop	pcs	2	o,oo2	25	
186	B1o2-15oo3	A114-19685	PIN, ϕ 7x68, pivot nut	pcs	1	o,32o	24	
187	B1o2-15oo4	994-588	LOCK BOLT STOP, trunnion bearing cover, with thread M1o	pcs	2	o,oo2o	25	
188	B1o2-15oo5	994-586	LOCK BOLT, trunnion bearing cover	pcs	2	o,1oo	25	
189	B1o2-15oo6	A114-197o6	LOCK-OUT BOLT, equilibrator	pcs	2	o,086	26	
19o	B1o2-15oo7	A114-29176	PULLEY, equilibrator wire rope	pcs	2	o,1oo	26	
191	B1o2-15oo8	A113-27176	SLIDER, recoil length regulator /only for B1/	pcs	1			
192	B1o3-15oo8	B3-8589	SLIDER, recoil length regulator /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	o,4oo		
193	B1o2-15oo9	B1-8394	TOP CARRIAGE BODY, cast steel, only for B1, B1A1 and B1A2	pcs	1	25,3oo		
194	B1o5-15oo9	B0-22171	TOP CARRIAGE BODY, cast steel, only for B1A3 and B1A4	pcs	1	23,2oo		
195	B1o2-15o11	A114-197o8	CHAIN, equilibrator action lock out bolt	pcs	2	o,022	26	
196	B1o2-15o12	994-585	UPPER BEARING, cradle trunnion bronze	pcs	2	o,18o	25	
197	B1o2-15o13	994-585	LOWER BEARING, cradle trunnion bronze	pcs	2	o,18o	25	
198	B1o2-15o14	A114-29175	BEARING, pulley shaft bronze	pcs	4	o,oo8	26	
199	B1o2-12oo3	B4-19469	LUBRICATOR composed of: 1 Lubricator body 1 Lubricator spring 1 Lubricator ball	pcs	2	o,oo3	25	X

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
200	Blo2-15015	A114-19738	NUT, M 10, toothed sector fastening bolt	pcs	8	0,015	25	
201	Blo2-15016	994-2516	NUT, M 10, slider fastening screw castle	pcs	2	0,010		
202	Blo2-15017	994-2519	NUT, M 10x1,5, lower shield bracket	pcs	2	0,036	27	
203	Blo2-15018	A114-19687	NUT, pivot, with square thread, pitch 4 mm	pcs	1	0,250	24	
204	Blo2-15019	A113-19714	BRACKET, shield lower	pcs	1	2,150	27	
205	Blo2-15020	A114-19653	SPRING, gunner protector leaf	pcs	1	0,025	28	
206	Blo2-15021	114-1252	SHAFT, Ø 22x31,5, trunnion bearing cover	pcs	2	0,090	25	
207	Blo2-15022	994-589	SHAFT, Ø 8x26, lock bolt handle	pcs	2	0,012	25	
208	Blo2-15023	A114-19709	SHAFT, Ø 15x33 equilibrator wire rope pulley	pcs	2	0,046	26	
209	Blo2-15024	994-1101	WASHER, Ø 20x10,5x3, slider fastening nut steel	pcs	2	0,003		
210	Blo2-15025	114-29078	WASHER, Ø 28x16x3, lower shield bracket nut elastic	pcs	2	0,010	27	
211	Blo2-15026	114-29241	WASHER, lower shield bracket spacer	pcs	2	0,002	27	
212	Blo2-15027	A114-23860	INDICATOR, top carriage position /for attaching barrel stop	pcs	1	0,016	26	
213	Blo2-15028	994-785	COVER, trunnion bearing	pcs	2	0,700	25	
214	Blo2-15029	A114-19707	COTTER PIN, Ø 1,8x26,5, slider fastening nut	pcs	2	0,001		
215	Blo2-15030	994-587	HANDLE, trunnion bearing cover lock bolt	pcs	2	0,100	25	
216	Blo2-15031	993-1246	SECTOR, elevating mechanism toothed right	pcs	1	1,100		X
217	Blo2-15032	993-1246	SECTOR, elevating mechanism toothed left	pcs	1	1,100	25	X
218	Blo2-15033	A114-16119	HOOK, equilibrator steel wire rope spring /for pack transport /	pcs	2	0,012		
219	Blo2-15034	A114-19702	RIVET, Ø 2,5x12,8, equilibrator steel wire rope spring hook	pcs	4	0,005		
220	Blo2-15035	A114-19652	RIVET, Ø 4x8, gunner protector spring	pcs	1	0,002	28	
221	Blo2-15036	A114-19690	SHIELD, equilibrator steel wire rope right	pcs	1	0,092	26	
222	Blo2-15037	A114-19689	SHIELD, equilibrator steel wire rope left	pcs	1	0,092		
223	Blo2-15038	994-1060	SCREW, M 10, length 27 mm, toothed sector fastening countersunk head	pcs	8	0,020	25	
224	Blo2-15039	114-20061	SCREW, M 10, length 27,5 mm, recoil length regulator slider countersunk head	pcs	1	0,020		
225	Blo2-15040	994-2515	SCREW, M 10, length 35 mm, recoil length regulator slider hexagon head	pcs	1	0,025		

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
226	Blo2-15o41	994-591	SCREW, M 5, length 14,1 mm, trunnion bearing	pcs	8	0,003	25	
227	Blo2-15o42	A114-23857	SCREW, M 5, length 7 mm, top carriage position indicator	pcs	2	0,003	26	
228	Blo2-15o43	A114-19700	SCREW, M 5, length 14 mm, equilibrator steel wire rope shield	pcs	6	0,003	26	
229	Blo2-15o44	A114-20016	SCREW, M 5, length 8 mm, pulley shaft lock	pcs	2	0,002	26	
			16000 - CRADLE					
230	Blo2-16000		CRADLE	set	1		29	
231	Blo2-16001	A114-16509	LOCK BOLT, barrel stay fastening	pcs	1	0,193	30	
232	Blo2-16002	A115-16295	CRADLE BODY	pcs	1	49,000	30	
233	Blo2-16003	A112-27183	COVER, cradle front	pcs	1	5,000	30	
234	Blo2-16004	A114-8123	COVER, compensator spring	pcs	1	0,131	30	
235	Blo2-16005	A114-16510	SCREW, M 6, length 13 mm, stay fastening lock bolt stop	pcs	1	0,002	30	
236	Blo2-16006		SCREW, M 10, stay fastening lock bolt safety, composed of	pcs	1	0,013	30	
		A114-19863	1 spring					
		A114-19860	1 ball					
		A114-29225	1 screw-body					
237	Blo2-16007	A114-27074	SCREW, M 6, length 14,5 mm, cradle front cover	pcs	2	0,004	30	
238	Blo2-16008	A114-27074	SCREW, M 6, length 20 mm, cradle front cover	pcs	2	0,005	30	
239	Blo2-16009	A114-8122	SCREW, M 4, length 12 mm, compensator spring cover	pcs	4	0,002	30	X
240	Blo2-16100	A113-16286	CRADLE TRUNNION-RIGHT	set	1		31	
241	Blo2-16101	A114-19504	BALL, Ø 3,5 mm, recoil indicator latch	pcs	1	0,001	32	
242	Blo2-16102	A114-19503	SPRING, Ø3,5x12, Ø of wire 0,5 mm, indicator latch	pcs	1	0,001	32	
243	Blo2-16103	A113-8096	CRADLE TRUNNION, body	pcs	1	2,000	31	
244	Blo2-16104	A114-19501	LATCH, recoil length indicator, body	pcs	1	0,008	31,32	
245	Blo2-16105	A114-16298	SCREW, M 5, length 24,5 mm, recoil length indicator latch fastening	pcs	1	0,004	31,32	
246	Blo2-16106	A114-19502	SCREW, M 5, length 6 mm, recoil length indicator latch spring fastening	pcs	1	0,001	32	
247	Blo2-16107	A114-8097	SCREW, M 10, length 30 mm, cradle trunnion fastening	pcs	6	0,027	31	X
248	Blo2-16200	112-8323	CRADLE TRUNNION- LEFT	set	1	0,027	33	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure	Note
1	2	3	4	5	6	7	8	9
249	Blo2-162o1	All4-8295	PIN, ϕ 3x23 mm, panoramic telescope fastening handle taper	pcs	1	0,002	33	
250	Blo2-162o2	All4-8294	STOP PIN, ϕ 3x15,5 mm, panoramic telescope fastening handle	pcs	1	0,001	33	
251	Blo2-162o3	All4-23736	NUT, M 6, panoramic telescope adjusting square head	pcs	2	0,002	33	
252	Blo2-162o4	All4-2o186	SPRING, ϕ 22/19, length 43, ϕ of wire 1,5 mm, panoramic telescope fastener torsion	pcs	1	0,009	33	
253	Blo2-162o5	111-29o91	CRADLE TRUNNION, body	pcs	1	2,500	33	
254	Blo2-162o6	All4-8293	HANDLE, panoramic telescope fastener winged	pcs	1	0,042	33	
255	Blo2-162o7	114-292o5	FASTENER, panoramic telescope	pcs	1	0,092	33	
256	Blo2-161o7	All4-8o97	SCREW, M 1o, length 3o mm, cradle trunnion fastening	pcs	6	0,026	33	X
257	Blo2-162o8	All4-23735	SCREW, M 6, length 16 mm, panoramic telescope adjusting	pcs	2	0,003	33	
258	Blo2-17o0o		17o0o - HYDROPIEUMATIC RECUPERATOR					
259	Blo2-171o0		RECUPERATOR	set	1		34	
260	Blo2-171o1	All12-8117	CYLINDER, recuperator	pcs	1	3,460	34	
261	Blo2-171o2	All4-8115	NUT, M 42x1,5, recuperator cylinder sealing fastening	pcs	1	0,068	34	
262	Blo2-171o3	All4-8o85	NUT, M 42x1,5, recuperator cylinder cover	pcs	1	0,1o3	34	
263	Blo2-171o4	All4-8o84	RING, ϕ 58/54, thickness 2 mm, recuperator cylinder copper	pcs	1	0,006	34	
264	Blo2-171o5	114-8116	JOINTING, ϕ 51,5/42,5 thickness 12 mm, recuperator cylinder lead / only for B1 /	pcs	1			
265	Blo3-171o5	114-8259	JOINTING, ϕ 51,5/42,5 thickness 12 mm, recuperator cylinder rubber / only for B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1			
266	Blo5-171o5	All4-8259A	JOINTING, ϕ 51,5/42,5, thickness 12 mm, recuperator cylinder rubber / only for B1A3 from No 31o3 and B1A4	pcs	1	0,011	34	
267	Blo2-172o0	All3-8o05	PISTON WITH PISTON ROD	set	1		35	
268	Blo2-172o1	All4-8o34	PISTON ROD, recuperator	pcs	1	2,000	35	
269	Blo2-172o2	All4-8o29	PISTON BODY, recuperator bronze /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1			
270	Blo5-172o2	All4-8o29A	PISTON BODY recuperator bronze /only for B1A3 from No 31o3 and B1A4	pcs	1	0,140	35	

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Item No	Nomenclature number	Producer's internal reference	DE NOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
271	B1o2-172o3	A114-8o33	Nut, M 18x1,5, piston jointing /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1			
272	B1o5-172o3	A114-8o33A	NUT, M 18x1,5, piston jointing /only for B1A3 from No 31o3 and B1A4	pcs	1	o,07o	35	
273	B1o2-172o4	A114-8o27	NUT, M 12, recuperator piston castle	pcs	1	o,018	35	
274	B1o2-172o5	A114-8o28	WASHER, Ø 28/13, thickness 2 mm piston	pcs	1	o,0o8	35	
275	B1o2-172o6	A114-8o32	RING, piston jointing steel /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1			
276	B1o5-172o6	A114-8o32A	RING, piston jointing steel /only for B1A3 from No 31o3 and B1A4	pcs	1	o,05o	35	
277	B1o2-172o7	A114-8o26	COTTER PIN, Ø 2,7x35 mm, piston nut	pcs	2	o,0o2	35	
278	B1o2-172o8	A114-8o31	JOINTING, Ø 37/19, thickness 8,5 mm recuperator piston rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2	pcs	1			X
279	B1o5-172o8	A114-8o31A	JOINTING, Ø 37,5/18,5 mm, thickness 8,5 mm, recuperator piston rubber /only for B1A3 from No 31o3 and B1A4 /	pcs	1	o,0o6	35	X
28o	B1o2-173oo		RECUPERATOR PISTON ROD EXTENSION	set	1		34	
281	B1o2-173o1	A114-811o	PIN, Ø 3x32 mm, piston rod extension	pcs	1	o,0o2	36	
282	B1o2-173o2	A114-23935	RETAINER, recuperator piston rod buffer	pcs	1	o,09o	36	
283	B1o2-173o3	A114-8112	BUFFER, Ø 48/16 thickness 16,5 mm, piston rod rubber	pcs	1	o,032	36	
284	B1o2-173o4	A114-81o9	EXTENSION, recuperator piston rod	pcs	1	o,7oo	36	
285	B1o2-173o5	A114-8111	SCREW, M 5, length 15 mm, recuperator piston rod buffer	pcs	4	o,0o3	36	
286	B1o2-174oo		RECUPERATOR PISTON ROD AND HYDRAULIC RECOIL BRAKE EXTENSION CONNECTOR	set	1		36	
287	B1o2-174o1	A114-81o8	NUT, M 32x1,5, recuperator piston rod fastening	pcs	1	o,096	36	
288	B1o2-174o2	A114-81o7	NUT, M 32x1,5, hydraulic recoil brake piston rod connector fastening	pcs	1	o,06o	36	
289	B1o2-174o3	114-29962	CONNECTOR BODY, recuperator piston rod extension and hydraulic recoil brake extension /with bolt 114-29957 /	pcs	1	o,8oo	36	
29o	B1o2-175oo	A113-8oo7	RECUPERATOR CYLINDER STUFFING BOX	set	1		36	
291	B1o2-175o1	A114-8o46	BOX BODY, recuperator stuffing	pcs	1	o,8oo	37	
292	B1o2-175o2	A114-8o49	BEARING BUSHING, Ø 22/16, length 21 mm stuffing box nut bronze	pcs	1	o,028	37	

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Notes
1	2	3	4	5	6	7	8	9
293	B1o2-175o3	A114-8o45	NUT, M 36x1,5, recuperator cylinder stuffing box packing steel /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,o73	37	
294	B1o5-175o3	A114-8o45A	NUT, M 36x1,5, recuperator cylinder stuffing box packing steel /only for B1A3 from No 31o3 and B1A4 /	pcs	1			
295	B1o2-175o4	A114-8o5o	NUT, M 36/1,5, recuperator cylinder stuffing box /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,125	37	
296	B1o5-175o4	A114-8o5oA	NUT, M 36x1,5, recuperator cylinder stuffing box / only for B1A3 from No 31o3 and B1A4/	pcs	1			
297	B1o2-175o5	A114-8o48	RING, recuperator cylinder stuffing box packing steel / only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,o18	37	
298	B1o5-175o5	A114-8o48A	RING, recuperator cylinder stuffing box packing steel /only for B1A3 from No 31o3 and B1A4/	pcs	1			
299	B1o2-175o6	A114-8114	RING, Ø 58/54, thickness 2 mm, stuffing box copper	pcs	1	o,oo6	37	
300	B1o2-175o7	A114-8o47	PACKING, Ø 31/13, thickness 8 mm, recuperator cylinder stuffing box rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	2	o,oo4	37	X
301	B1o5-175o7	A114-8o47A	PACKING, Ø 31,5/12,5, thickness 8 mm, recuperator cylinder stuffing box rubber / only for B1A3 from No 31o3 and B1A4/	pcs	2			X
302	B1o6-175o7	B4-26934	PACKING, Ø 31,5/14,5, thickness 7 mm, recuperator cylinder stuffing box rubber /only for B1A3 from No 31o3 and B1A4/ replaces packing B1o5-175o7 /	pcs	2			X
303	B1o2-176oo	114-2oo53	RECUPERATOR FILLING VALVE	set	1		38	
304	B1o2-176o1	114-29437	PLUG, M 22x1,5, recuperator nitrogen filling opening brass	pcs	1	o,o65	38	
305	B1o2-176o2	A113-23948	VALVE BODY	pcs	1	o,323	38	
306	B1o2-176o3	A114-23949	NUT, M 1ox1, height 13 mm, recuperator nitrogen filling valve	pcs	1	o,o1o	38	
307	B1o2-176o4	A114-8o8o	COVER, valve body	pcs	1	o,o74	38	
308	B1o2-176o5	A114-23951	RING, Ø 13,8/1o,1, thickness 1 mm, valve packing pressing brass	pcs	2	o,ool	38	
309	B1o2-176o6	A114-8o78	RING, Ø 5o/45, thickness 2 mm, valve body copper	pcs	1	o,oo7	38	
310	B1o2-176o7	A114-29436	VALVE, recuperator nitrogen filling	pcs	1	o,o2o	38	
311	B1o2-176o8	A114-2395o	PACKING, Ø 13,8/1o,1, thickness 5 mm, valve rubber	pcs	1	o,ool	38	

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
312	B1o2-176o9	All4-23953	SEAL, Ø 19,8/13, thickness 3,5 mm, recuperator nitrogen filling plug leather /only for B1,B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	o,ool	38	
313	B1o5-176o9	All4-23953A	SEAL, Ø 19,8/13, thickness 3,5 mm, recuperator nitrogen filling plug leather /only B1A3 from No 31o3 and B1A4/	pcs	1			
314	B1o2-1761o	All4-8o79	SCREW, M 4, length 8 mm, valve nut safety screw	pcs	1	o,ool	38	
315	B1o2-17611	All4-8o81	SCREW, M 6, length 19 mm, valve cover fastening	pcs	1	o,oo4	38	
316	B1o2-177oo	All3-8oo6	FLOATING PISTON	set	1	o,oo4	4o,47	
317	B1o2-177o1	All4-8o36	BUSHING, Belleville springs bronze	pcs	1	o,276	4o	
318	B1o2-177o2	All3-19215	FLOATING PISTON BODY / only for B1, B1A1, B1A3 and B1A2 up to No 31o2/	pcs	1	o,45o	4o	
319	B1o5-177o2	All3-19215A	FLOATING PISTON BODY /only for B1A3 from No 31o3 and B1A4/	pcs	1			
32o	B1o2-177o3	All4-8o44	NUT, M 26x1, floating piston packing steel /only for B1, B1A1, B1A2 and B1A3 up to No 31o2	pcs	1	o,oo4	4o	
321	B1o5-177o3	All4-8o44A	NUT, M 26x1, floating piston packing steel /only for B1A3 from No 31o3 and B1A4/	pcs	1			
322	B1o2-177o4	All4-8o41	NUT, M 26x1,5, floating piston packing retaining bronze	pcs	1	o,132	4o	
323	B1o2-177o5	All4-8o35	NUT, M 22x1,5, Belleville springs pressing, with square wrench hole	pcs	1	o,18o	4o	
324	B1o2-177o6	All4-8o37	BELLEVILLE SPRING, Ø 37/23,2 thickness 3 mm	pcs	8	o,ol7	4o	
325	B1o2-177o7	All4-8o39	WASHER, Ø 37,5/23, thickness 4 mm, Belleville spring steel	pcs	1	o,o21	4o	
326	B1o2-177o8	All4-8o43	RING, packing steel /only for B1, B1A1, B1A2, B1A3 up to No 31o2/	Pcs	1	o,oo5o	4o	
327	B1o5-177o8	All4-8o43A	RING, packing steel /only for B1A3 from No 31o3 and B1A4/	pcs	1			
328	B1o2-177o9	All4-8o42	PACKING, Ø 49/31, thickness 8 mm, floating piston rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	2	o,oo9	4o	X
329	B1o5-177o9	All4-8o42A	PACKING, Ø 5o/3o,5, thickness 9 mm, floating piston rubber /only for B1A3 from No 31o3 and B1A4/	pcs	2			X
33o	B1o2-1771o		PACKING, floating piston rubber with leather liner /only for B1, B1A1, and B1A2 up to No 29o6/	pcs	1			

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
312	B1o2-176o9	All4-23953	SEAL, Ø 19,8/13, thickness 3,5 mm, recuperator nitrogen filling plug leather /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	o,ool	38	
313	B1o5-176o9	All4-23953A	SEAL, Ø 19,8/13, thickness 3,5 mm, recuperator nitrogen filling plug leather /only B1A3 from No 31o3 and B1A4/	pcs	1			
314	B1o2-1761o	All4-8o79	SCREW, M 4, length 8 mm, valve nut safety screw	pcs	1	o,ool	38	
315	B1o2-17611	All4-8o81	SCREW, M 6, length 19 mm, valve cover fastening	pcs	1	o,oo4	38	
316	B1o2-177oo	All3-8oo6	FLOATING PISTON	set	1	o,oo4	4o,47	
317	B1o2-177o1	All4-8o36	BUSHING, Belleville springs bronze	pcs	1	o,276	4o	
318	B1o2-177o2	All3-19215	FLOATING PISTON BODY / only for B1, B1A1, B1A3 and B1A2 up to No 31o2/	pcs	1	o,45o	4o	
319	B1o5-177o2	All3-19215A	FLOATING PISTON BODY /only for B1A3 from No 31o3 and B1A4/	pcs	1			
32o	B1o2-177o3	All4-8o44	NUT, M 26x1, floating piston packing steel /only for B1, B1A1, B1A2 and B1A3 up to No 31o2	pcs	1	o,oo4	4o	
321	B1o5-177o3	All4-8o44A	NUT, M 26x1, floating piston packing steel /only for B1A3 from No 31o3 and B1A4/	pcs	1			
322	B1o2-177o4	All4-8o41	NUT, M 26x1,5, floating piston packing retaining bronze	pcs	1	o,132	4o	
323	B1o2-177o5	All4-8o35	NUT, M 22x1,5, Belleville springs pressing, with square wrench hole	pcs	1	o,18o	4o	
324	B1o2-177o6	All4-8o37	BELLEVILLE SPRING, Ø 37/23,2 thickness 3 mm	pcs	8	o,ol7	4o	
325	B1o2-177o7	All4-8o39	WASHER, Ø 37,5/23, thickness 4 mm, Belleville spring steel	pcs	1	o,o21	4o	
326	B1o2-177o8	All4-8o43	RING, packing steel /only for B1, B1A1, B1A2, B1A3 up to No 31o2/	Pcs	1	o,o5o	4o	
327	B1o5-177o8	All4-8o43A	RING, packing steel /only for B1A3 from No 31o3 and B1A4/	pcs	1			
328	B1o2-177o9	All4-8o42	PACKING, Ø 49/31, thickness 8 mm, floating piston rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	2	o,oo9	4o	X
329	B1o5-177o9	All4-8o42A	PACKING, Ø 5o/3o,5, thickness 9 mm, floating piston rubber /only for B1A3 from No 31o3 and B1A4/	pcs	2			X
33o	B1o2-1771o		PACKING, floating piston rubber with leather liner /only for B1, B1A1, and B1A2 up to No 29o6/	pcs	1			

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
331	B1o4-1771o	A114-8o4o	PACKING, Ø 48/23, thickness 12 mm, floating piston rubber /only for B1A2 from No 29o6 and B1A3 up to No 31o2/	pcs	1	o,o22	4o	
332	B1o5-1771o	A114-8o4oA	PACKING, Ø 4o/23, thickness 12 mm, floating piston rubber /only for B1A3 from No 31o3 and B1A4/	pcs	1			
333	B1o2-178oo	112-29925	COUNTERRECOIL SPEED REGULATOR	set	1		41,47	
334	B1o2-178o1	114-29934	PLUG, M 16x1,5 length 12 mm, recuperator fluid filling opening /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	o,o14	41	
335	B1o5-178o1	114-29934A	PLUG, M 16x1,5 length 12 mm, recuperator fluid opening / only for B1A3 from No 31o3 and B1A4/	pcs	1			
336	B1o2-178o2	114-29294	NUT, M 36x1,5, packing ring /only for B1, B1A1, B1A2 and B1A3 up to No 31o2	pcs	1	o,o48	41	
337	B1o5-178o2	114-29294A	NUT, M 36x1,5, packing ring /only for B1A3 from No 31o3 and B1A4/	pcs	1			
338	B1o2-178o3	114-8o61	NUT, M 36x1,5, packing retaining ring steel	pcs	1	o,o58	41	
339	B1o2-178o4	114-29926	NUT, M 14x1, regulator shaft /only	pcs	1	o,171	41	
34o	B1o3-178o4	B4-1o279	NUT, M 22x1,2, recuperator fluid refilling valve	pcs	1	o,o57	41	
341	B1o3-178o5	B4-1o28o	NUT, M 42x1,5, regulator valve /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,o62	41	
342	B1o2-178o6	114-29291	NUT, M 42x1,5, regulator valve /only for B1A3 from No 31o3 and B1A4/	pcs	1			
343	B1o5-178o6	114-29291A	NUT, M 12x1, regulator valve spring	pcs	1	o,oo8	41	
344	B1o2-178o7	A114-8o51	SPRING, Ø 27/15, length 48 mm, Ø of wire 6 mm, regulator shaft	pcs	1	o,o86	41	
345	B1o2-178o8	114-2996o	SPRING, Ø 9,8/7,8 length 12 mm, Ø of wire 1 mm, recuperator fluid refilling valve	pcs	1	o,ool	41	
346	B1o2-178o9	114-29954	SPRING, Ø 16,8/13,2, length 4o mm, Ø of wire 1,8 mm, regulator valve	pcs	1	o,oo8	41	
347	B1o2-1781o	114-8o52	SHAFT, regulator	pcs	1	o,188	41	
348	B1o2-17811	113-29933	INDICATOR, regulator valve opening	pcs	1	o,oo6	41	
349	B1o2-17812	A114-8o65	RING, regulator packing steel /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pos	1	o,o22	41	
35o	B1o2-17813	A114-8o6o	RING, regulator packing steel /only for B1A3 from No 31o3 and B1A4/	pcs	1			
351	B1o5-17813	A114-8o6oA	RING, Ø 2o/14, thickness 2,5 mm, regulator fluid refilling valve nut copper	pcs	1	o,oo3	41	
352	B1o3-17814	B4-1o282						

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
353	B1o2-17815	114-8113	RING, Ø 54/51, thickness 2 mm, counter-recoil speed regulator body copper	pcs	1	0,004	41	
354	B1o2-17816	A113-23877	REGULATOR BODY, counter-recoil speed /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	0,700	41	
355	B1o5-17816	A113-23877A	REGULATOR BODY, counter-recoil speed /only for B1A3 from No 31o3 and B1A4/	pcs	1			
356	B1o2-17817	B4-1o281	VALVE, recuperator fluid refilling brass	pcs	1	0,009	41	
357	B1o2-17818	A114-23878	VALVE, counter-recoil speed regulator	pcs	1	0,070	41	
358	B1o2-175o7	A114-8o47	PACKING, Ø 31/13, thickness 8 mm, counter-recoil speed regulator rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	2	0,004	41	X
359	B1o5-175o7	A114-8o47A	PACKING, Ø 31,5/12,5, thickness 8 mm, counter-recoil speed regulator rubber /only for B1A3 from No 31o3 and B1A4/	pcs	2			X
36o	B1o2-17819	114-29932	PACKING, Ø 12/4, thickness 4 mm, recuperator fluid refilling valve nut rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	0,001	41	
361	B1o5-17819	114-29932A	PACKING, Ø 14/6, thickness 3 mm, recuperator fluid refilling valve nut rubber /only for B1A3 from No 31o3 and B1A4/	pcs	1			
362	B1o2-1782o	114-29928	PACKING, Ø 15/6,5, thickness 4 mm, recuperator fluid refilling plug rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	0,001	41	
363	B1o5-1782o	114-29928A	PACKING, Ø 16/6,5, thickness 3 mm, recuperator fluid refilling plug rubber /only for B1A3 from No 31o3 and B1A4/	pcs	1			
364	B1o2-17821	114-16756	PACKING, Ø 48/42, thickness 3 mm, regulator valve nut rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	0,002	41	
365	B1o5-17821	114-16756A	PACKING, Ø 48/42, thickness 3,2, regulator valve nut rubber /only for B1A3 from No 31o3 and B1A4 /	pcs	1			
366	B1o2-17822	114-29929	SCREW, M 6, length 9 mm, regulator shaft nut lock	pcs	1	0,002	41	
367	B1o2-17823	A114-8o62	SCREW, M 4, length 1o mm, regulator valve opening indicator	pcs	2	0,002	41	
368	B1o2-17824	A114-2388o	SCREW, M 3, length 11, regulator valve turning stop	pcs	1	0,001	41	
369	B1o2-16oo9	A114-8122	SCREW, M 4, length 12 mm, regulator valve nut lock	pcs	1	0,001	41	X
37o	B1o2-17825	114-8o53	SCREW, M 8xo,75, length 9,5 mm, regulator valve	pcs	1	0,002	41	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
371			18000 - HYDRAULIC RECOIL BRAKE					
371	B1o2-18000		HYDRAULIC RECOIL BRAKE	set	1			
372	B1o2-18100	A113-23773	PISTON WITH PISTON ROD	set	1			
373	B1o2-18101	A113-23774	PISTON ROD, hydraulic recoil brake	pcs	1	2,400	42	
374	B1o2-18102	A114-23775	PISTON, hydraulic recoil brake	pcs	1	0,800	42	
375	B1o2-18103	A114-23776	SCREW, M 6, Length 6 mm, piston lock	pcs	3	0,001	42	
376	B1o2-18200		PISTON ROD EXTENSION	set	1			
377	B1o2-18201	A114-8101	BUSHING, counter-recoil shock absorber guide	pcs	1	0,057	36	
378	B1o2-18202	A114-8104	PIN, ϕ 3x32, hydraulic recoil brake piston rod extension	pcs	1	0,002	36	
379	B1o2-18203	A114-8106	KEY, hydraulic brake piston rod extension connector fastening	pcs	1	0,007	36	
380	B1o2-18204	A113-8103	EXTENSION, hydraulic brake piston rod	pcs	1	0,800	36	
381	B1o2-18300		COUNTER-RECOIL PISTON ROD WITH PISTON	set	1			
382	B1o2-18301	A113-16256	PISTON, counter-recoil bronze	pcs	1	0,186	42	
383	B1o2-18302	A115-8559	PISTON ROD, counter-recoil /only for B1 /	pcs	1			
384	B1o3-18302	A115-16253	PISTON ROD, counter-recoil /for B1A1, B1A2, B1A3 and B1A4/	pcs	1	2,900	42	
385	B1o2-18303	114-16255	SPRING, ϕ 9/7, length 28, ϕ of wire 1 mm, counter-recoil piston valve	pcs	1	0,002	42	
386	B1o2-18304	A113-16257	SHOCK ABSORBER, counter-recoil	pcs	1	0,033	42	
387	B1o2-18305	A114-8098	VALVE, counter-recoil piston	pcs	1	0,012	42	
388	B1o2-18306	114-29201	SCREW, M 4, counter-recoil piston lock	pcs	1	0,001	42	
389	B1o2-18400	A113-8002	HYDRAULIC RECOIL BRAKE STUFFING BOX-FRONT	set	1		43	
390	B1o2-18401	A114-8014	STUFFING BOX BODY, hydraulic recoil brake	pcs	1	0,550	43,47	
391	B1o2-18402	A114-8017	BEARING, packing nut bronze	pcs	1	0,023	43	
392	B1o2-18403	A114-8012	BEARING, packing retaining bronze	pcs	1	0,037	43	
393	B1o2-18404	A114-8016	NUT, M 38x1,5, packing ring /only for B1, B1A1, B1A2 and B1A3 up to No 3102/	pcs	1	0,010	43	
394	B1o4-18404	A114-8016A	NUT, M 38x1,5, packing ring /only for B1A3 from No 3103 and B1A4/	pcs	1			
395	B1o2-18405	A114-16111	NUT, M 38x1,5, packing retaining bearing	pcs	1	0,058	43	

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
396	B1o2-184o6	All4-8o87	RING, Ø57/52, thickness 2 mm, hydraulic brake stuffing box copper	pcs	1	0,006	43	X
397	B1o2-172o8	All4-8o31	PACKING, Ø 37/19, thickness 8,5 mm, hydraulic brake stuffing box rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	0,007	43	X
398	B1o5-172o8	All4-8o31A	PACKING, Ø 37,5/18,5, thickness 8,5 mm, hydraulic brake stuffing box rubber /only for B1A3 from No 31o3 and B1A4 /	pcs	1			
399	B1o2-184o8	All4-16297	PACKING 8x8, length 35,8 mm, talloved	pcs	1			X
400	B1o2-185oo	All4-8oo9	HYDRAULIC RECOIL BRAKE STUFFING BOX-REAR	set	1	0,020	43	
401	B1o2-185o1	All4-8o68	STUFFING BOX, BODY, hydraulic recoil brake /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	0,600	44	
402	B1o5-185o1	All4-8o68A	STUFFING BOX, body, hydraulic recoil brake /only for B1A3 from No 31o3 and B1A4/	pcs	1			
403	B1o2-185o2	All4-8o71	BEARING, packing retaining bronze	pcs	1	0,093	44	
404	B1o2-185o3	All4-8o67	NUT, M 52x1,5, packing ring /only	pcs	1			
405	B1o5-185o3	All4-8o67A	NUT, M 52x1,5, packing ring /only for B1A3 from No 31o3 and B1A4/	pcs	1			
406	B1o2-185o4	All4-8o72	NUT, M 50x1,5, for the packing retaining ring of for bearing fastening	pcs	1	0,073	44	
407	B1o2-184o6	All4-8o87	RING, Ø 57/52, thickness 2 mm, hydraulic brake stuffing box copper	pcs	1	0,006	44	X
408	B1o2-177o9	All4-8o42	PACKING, Ø 49/31, thickness 8 mm, hydraulic brake stuffing box rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	0,009	44	X
409	B1o5-177o9	All4-8o42A	PACKING, Ø 50/30,5, thickness 9 mm, hydraulic brake stuffing box rubber / only for B1A3 from No 31o3 and B1A4 /	pcs	1			X
410	B1o2-185o6	All4-8o7o	PACKING, 8x8, length 900 mm, talloved	pcs	1	0,015	44	
411	B1o2-186oo	All4-29914	COMPENSATOR CYLINDER STUFFING BOX WITH RECOIL BRAKE FLUID REFILLING VALVE	set	1		38,39	
412	B1o2-186o1	114-29917	PLUG T, M 16x1,5, recoil brake fluid refilling valve /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	1	0,020	39	
413	B1o5-186o1	114-29917A	PLUG T, M 16x1,5, recoil brake fluid refilling valve /only for B1A3 from No 31o3 and B1A4/	pcs	1			
414	B1o2-186o2	All4-8o19	PLUG V, M 8, recoil brake air vent, during fluid refilling	pcs	1	0,013	39	

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
415	B1o2-186o3	All4-29919	BALL, Ø 5, recoil brake fluid refilling valve	pcs	1	o,ool	39	
416	B1o2-186o4	All4-29915	STUFFING BOX, body, compensator cylinder	pcs	1	o,5oo	39	
417	B1o2-186o5	All4-29953	SPRING, Ø 6/4 length 22, Ø of wire 1 mm, recoil brake fluid refilling valve	pcs	1	o,oo2	39	
418	B1o2-186o6	All4-29956	RETAINER, recoil brake fluid refilling valve ball brase	pcs	1	o,ool	39	
419	B1o2-186o7	All4-8o86	RING, Ø 54/51,5, thickness 2 mm, stuffing box copper	pcs	1	o,oo4	39	
42o	B1o2-186o8	All4-2992o	RING, Ø 16/12, thickness 3 mm, valve body copper	pcs	1	o,oo3	39	
421	B1o2-186o9	All4-29916	VALVE BODY, recoil brake fluid refilling	pcs	1	o,o72	39	
422	B1o2-1861o	All4-8o2o	SEAL, Ø 16/7, thickness 3 mm, recoil brake fluid refilling valve plug T rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2	pcs	1	o,ool	39	
423	B1o5-1861o	All4-8o2oA	SEAL, Ø 16/9, thickness 3 mm, recoil brake fluid refilling valve plug rubber T /only for B1A3 from No 31o3 and B1A4/	pcs	1			
424	B1o2-18611	All4-29921	SEAL, Ø 16/6,5 thickness 4 mm, recoil brake air vent plug V rubber	pcs	1	o,ool	39	
425	B1o2-18612	All4-29923	SCREW, M 8, length 6 mm, recoil brake fluid refilling valve stop hollow	pcs	1	o,oo2	39	
426	B1o2-18613	All4-29918	SCREW, M 4, length 6 mm, valve body lock	pcs	1	o,ool	39	
427	B1o2-187oo		RECOIL BRAKE COMPENSATOR	set	1		45	
428	B1o2-187o1	All4-2o187	PIN, Ø 12x62, compensator body	pcs	1	o,o55	45	
429	B1o2-187o2	All4-8o22	STOP BOLT, Ø 14x94, compensator piston steel	pcs	1	o,1o2	45	
43o	B1o2-187o3	All4-8o23	PISTON, compensator bronze /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1		45	
431	B1o5-187o3	All4-8o23A	PISTON, compensator bronze /only for B1A3 from No 31o3 and B1A4/	pcs	1	o,25o		
432	B1o2-187o4	All4-2o169	NUT, M 2ox1,5, compensator body	pcs	1	o,o71	45	
433	B1o2-187o5	All4-8o25	NUT, M 24x1,5, compensator piston packing retaining bronze	pcs	1	o,o76	45	
434	B1o2-187o6	All4-2oo17	SPRING Belleville, Ø 44/22, thickness 2 mm	pcs	2	o,o26	45	
435	B1o2-187o7	All3-8o93	SPRING, Ø 41/31, length 185, Ø of wire 5 mm, compensator	pcs	1	o,223	45	
436	B1o2-187o8	All4-2o171	PARTITION, cradle middle cylinder	pcs	1	o,35o	45	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
437	B1o2-187o9	All4-2oo28	RING, compensator body packing retaining steel	pcs	1	o,o22	45	
438	B1o2-1871o	All4-8o24	RING, compensator, piston packing /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,o32	45	
439	B1o5-1871o	All4-8o24A	RING, compensator piston packing /only for B1A3 from No 31o3 and B1A4 /	pcs	1			
44o	B1o2-18711	All4-2o172	PACKING, Ø 48/36, thickness 1 mm, compensator body rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,o11	45	
441	B1o5-18711	All4-2o172A	PACKING, Ø 48/36,1 thickness 9 mm, compensator body rubber /only for B1A3 from No 31o3 B1A4/	pcs	1			
442	B1o2-177o9	All4-8o42	PACKING, Ø 49/31, thickness 8 mm, compensator piston rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2 /	pcs	1	o,oo8	45	X
443	B1o5-177o9	All4-8o42A	PACKING, Ø 5o/3o, thickness 9 mm, compensator piston rubber /only for B1A3 from No 31o3 and B1A4/	pcs	1			X
444	B1o2-188oo	111-2oo4o	RECOIL LENGTH REGULATOR	set	1		46	
445	B1o2-188o1	All4-8254	PIN, Ø 3x31, toothed sector shaft nut and roller shaft nut taper	pcs	2	o,oo2	46	
446	B1o2-188o2	All4-8252	ROLLER, slide	pcs	1	o,o15	46	
447	B1o2-188o3	All4-8244	BEARING BUSHING, Ø 2o/15, length 29, toothed arc shaft bronze	pcs	1	o,o31	46	
448	B1o2-188o4	All4-19279	NUT, M 16x1,5, with 16 mm, counter-recoil piston rod toothed sector fastening	pcs	1	o,o58	46	
449	B1o2-188o5	All4-8o83	LOCK NUT, M 16x1,5, width 8 mm, counter-recoil rod fastening nut	pcs	1	o,o56	46	
45o	B1o2-188o6	All4-8241	NUT, M 12, toothed sector shaft	pcs	1	o,o3o	46	
451	B1o2-188o7	All4-8248	NUT, M 14x1, recoil length adjusting, with left-handed and right-handed thread	pcs	1	o,116	46	
452	B1o2-188o8	All4-8247	LOCK NUT, M 14x1, adjusting nut right-handed thread	pcs	1	o,o3o	46	
453	B1o2-188o9	All4-8247	LOCK NUT, M 14x1, adjusting nut, left-handed thread	pcs	1	o,o3o	46	
454	B1o2-1881o	All4-8242	SHAFT, toothed sector	pcs	1	o,o68	46	
455	B1o2-18811	All4-2oo24	SHAFT, roller	pcs	1	o,o26	46	
456	B1o2-18812	All4-8243	WASHER, Ø 28/12,5, thickness 3 mm, toothed sector shaft nut steel	pcs	1	o,o12	46	
457	B1o2-18813	All4-2oo29	WASHER, Ø 2o/12, thickness 2 mm, roller steel	pcs	1	o,oo3	46	
458	B1o2-18814	All4-23941	WASHER, counter-recoil piston rod toothed sector bronze	pcs	1	o,o88	46,47	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Notes
1	2	3	4	5	6	7	8	9
459	B1o2-18815	All3-8246	RACK ROD, recoil length regulator	pcs	1	0,500	46	
460	B1o2-18816	All3-20020	ROD, recoil length regulator slider	pcs	1	0,700	46	
461	B1o2-18817	All3-8239	TOOTHED ARC, counter recoil piston rod	pcs	1	0,128	46	
462	B1o2-18818	B4-11243	SCREW, M 6, length 14, slider rod stop	pcs	1	0,004	46	
463	B1o2-18819	All3-8414	SPUR GEAR, with toothed sector, counter-recoil piston rod toothed sector operating	pcs	1	0,132	46	
464	B1o2-19000		19000 - ELEVATING MECHANISM					
465	B1o2-19100	All2-19679	ELEVATING MECHANISM	set	1			
466	B1o2-19101	All4-2820	ELEVATING MECHANISM GEAR CASING WITH HAND WHEEL	set	1		48	
467	B1o2-19102	114-2840	PIN, Ø 3x26, length 26 mm, elevating mechanism wheel	pcs	1	0,002	48	X
468	B1o2-19103	B4-8406	PIN, Ø 3x21, length 21 mm, elevating wheel handle shaft	pcs	1	0,002	48	
			LOCK BOLT, hand wheel casing fastening/during pack transport/	pcs	1	0,055		
469	B1o2-19104	B4-17658	KEY, bevel gear	pcs	1	0,001		
470	B1o2-19105	All3-19696	CASING, elevating mechanism hand wheel	pcs	1	1,000	48	
471	B1o2-19106	All4-2821	BEARING BUSHING, Ø 21/15, length 16 with flange Ø 27 mm, elevating mechanism spindle and hand wheel shaft bronze	pcs	2	0,030	48	X
472	B1o2-19107	114-2847	BEARING BUSHING, Ø 40/30, length 24 with flange Ø 50 mm, hand wheel casing bronze	pcs	1	0,125	49	
473	B1o2-19108	All4-19671	NUT, M 35x1,5, elevating mechanism hand wheel shaft	pcs	1	0,100	48	
474	B1o2-19109	All4-19672	NUT, M 27x1, elevating mechanism spindle connector bearing bronze	pcs	1	0,035	50	
475	B1o2-19110	B4-8407	SPRING, hand wheel casing fastening lock bolt	pcs	1	0,004		X
476	B1o2-19111	114-2817	SPRING, Ø 22/16, length 122 Ø of wire 3 mm, elevating mechanism spindle	pcs	1	0,065	50	
477	B1o2-19112	B4-3168	SHAFT, with bevel gear, elevating mechanism hand wheel	pcs	1	0,154	48	
478	B1o2-19113	All4-19668	SHAFT, elevating mechanism wheel handle	pcs	1	0,047	48	
479	B1o2-19114	B4-17385	WASHER, Ø 15/6, thickness 2,5 mm, hand wheel casing fastening lock bolt	pcs	1	0,003		
480	B1o2-19115	B4-17653	WASHER, Ø 25,4/15,1, thickness 3 mm, elevating mechanism spindle spring	pcs	1	0,006	50	

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
481	B1o2-19116	114-2983	COVER, hand wheel casing, with thread M 52x1 and hexagon head	pcs	1	0,521	49	
482	B1o2-19117	A114-19669	HANDGRIP, elevating mechanism wheel handle aluminium	pcs	1	0,038	48	
483	B1o2-19118	A114-19697	CONNECTOR, elevating mechanism spindle	pcs	1	0,155	50	
484	B1o2-19119	A113-19678	WHEEL, elevating mechanism hand	pcs	1	0,800	48	
485	B1o2-19120	B4-17657	SPINDLE, elevating mechanism	pcs	1	0,200	50	
486	B1o2-19121	A114-19670	SCREW, M 8, length 12 mm, hand wheel shaft nut lock	pcs	1	0,004	48	X
487	B1o2-19122	A114-19695	SCREW, M 8, length 29 mm, left thread, hand wheel shaft bearing	pcs	1	0,018	48	
488	B1o2-19123	114-2845	SCREW, M 15x1, length 40 mm, with flange Ø 50 mm, hand wheel casing lock	pcs	1	0,120	49	
489	B1o2-19124	B4-17655	SCREW, M 6, length 14 mm, elevating gear spindle bevel gear lock	pcs	1	0,002	49	
490	B1o2-19125	B4-17656	SCREW, M 5, length 7 mm, elevating mechanism spindle bearing lock	pcs	3	0,002	50	
491	B1o2-19126	B4-17654	BEVEL GEAR, elevating mechanism spindle	pcs	1	0,100	49	
492	B1o2-19200	A111-19837	ELEVATING MECHANISM SPINDLE	set	1			
493	B1o2-19201	A114-19820	PIN, Ø 3x22, elevating mechanism shaft nut	pcs	1	0,002	51	
494	B1o2-19202	A114-19822	PIN, Ø 3x25, elevating mechanism joint fork	pcs	2	0,002	52	X
495	B1o2-19203	A114-2831	BALL, Ø 20, elevating mechanism joint	pcs	1	0,022	52	X
496	B1o2-19204	A111-2813	CASING, worm and worm wheel	pcs	1	3,300	53	
497	B1o2-19222	A114-19833 /SKF-6302/	BALL BEARING, Ø 42/15x13, radial	pcs	2	0,088	52	
498	B1o2-19205	A114-19830	BEARING, Ø 70/60x20, with flange Ø 78 mm, elevating mechanism shaft bronze	pcs	1	0,300	53	
499	B1o2-19206	A114-19831	BEARING, Ø 30/20x20, with flange Ø 38 mm, elevating mechanism shaft bronze	pcs	1	0,050	51	
500	B1o2-19207	A114-19829	NUT, M 8, worm wheel fastening bolt hexagon	pcs	6	0,006	53	
501	B1o2-19208	A114-19825	NUT, M 14x1,5, elevating mechanism shaft	pcs	1	0,028	51	
502	B1o2-19209	A114-19819	NUT, M 50x2, ball bearing retaining hexagon	pcs	1	0,140	52	
503	B1o2-19210	A113-2814	BRACKET, elevating mechanism shaft	pcs	1	1,550	51	
504	B1o2-19211	A113-19836	SHAFT, elevating mechanism, with spur gears	pcs	1	2,800	53	

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Notes
1	2	3	4	5	6	7	8	9
505	Blo2-19212	All4-19828	WASHER, ϕ 32/14,1, thickness 3 mm, elevating mechanism shaft nut	pcs	1	0,015	51	
506	Blo2-19213	All3-19835	COVER, worm and worm wheel, composed of: 1 Cover 2 Joint spindle fastening plate spring /during pack transport/ 3 Plate spring rivet ϕ 2,5x5 mm	pcs	1	0,400	53	
507	Blo2-19214	A994-883	WORM WHEEL, bronze	pcs	1	1,300	53	
508	Blo2-19215	All4-2849	WORM, elevating mechanism	pcs	1	0,600	52	
509	Blo2-19216	All4-2832	FORK, elevating mechanism joint	pcs	2	0,066	52	X
510	Blo2-19217	All4-19827	SPINDLE, joint fork	pcs	1	0,060	52	
511	Blo2-19218	All4-19824	BOLT, M 8, length 28 mm, with hexagon head, worm wheel fastening	pcs	6	0,015	53	
512	Blo2-19219	All4-19823	BOLT, M 10, length 28 mm, with hexagon head, worm and worm wheel casing and shaft bracket fastening	pcs	9	0,026	51	
513	Blo2-19121	All4-19670	SCREW, M 8, length 12 mm, ball bearing retaining nut lock	pcs	1	0,003	52	
514	Blo2-19220	All4-2835	SCREW, M 8x0,75, length 9,5 mm, joint fork	pcs	4	0,003	52	X
515	Blo2-19221	All4-19818	SCREW, M 5, length 14 mm, worm and worm wheel casing cover	pcs	8	0,003	53	
			20000 - TRAVERSING MECHANISM					
516	Blo2-20000		TRAVERSING MECHANISM	set	1			
517	Blo2-20001	All4-2830	BUSHING, traversing mechanism spindle with bevel gear	pcs	1	0,280	54	
518	Blo2-20002	All4-19682	BUSHING, with traversing mechanism hand wheel shaft	pcs	1	0,948	54	
519	Blo2-19202	All4-19822	PIN, ϕ 3x25, traversing mechanism joint fork	pcs	2	0,002	54	X
520	Blo2-19101	All4-2820	PIN, ϕ 3x26, traversing mechanism hand wheel	pcs	1	0,002	54	X
521	Blo2-20003	All4-2827	KEY, bevel gear	pcs	1	0,002	55	
522	Blo2-19203	All4-2831	BALL, ϕ 20, traversing mechanism joint	pcs	1	0,021	52	X
523	Blo2-20004	All2-19683	CASING, traversing mechanism cast	pcs	1	5,200	54	
524	Blo2-20017	A994-919 /SKF-6202/	BALL BEARING, ϕ 35/15x11, traversing mechanism radial	pcs	2	0,045	55	
525	Blo2-19106	All4-2821	BEARING BUSHING, ϕ 21/15x16, with flange ϕ 27 mm, bronze, traversing mechanism spindle with bevel gear and hand wheel shaft	pcs	4	0,030	54	X

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Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
2	3	4	5	6	7	8	9
B1o2-12o03	B4-19469	LUBRICATOR, composed of: 1 Lubricator body 1 Ball 1 Spring	pcs	1	0,003	12	X
B1o2-20o05	A114-2829	NUT, M 5ox1,5, traversing mechanism worm ball bearing retaining	pcs	1	0,188	55	
B1o2-20o06	A994-622	NUT, M 24x1,5, traversing mechanism hand wheel shaft bracket	pcs	1	0,030	54	
B1o2-20o07	A114-27080	SHAFT, traversing mechanism hand wheel	pcs	1	0,223	54	
B1o2-20o08	A114-19662	SHAFT, traversing mechanism hand wheel handle	pcs	1	0,025	54	
B1o2-20o09	A114-2823	COVER, traversing mechanism casing	pcs	1	0,090	55	
B1o2-20o10	A114-2822	WORM, traversing mechanism	pcs	1	0,700	55	
B1o2-20o11	A114-19661	HANDGRIP, traversing mechanism hand wheel handle aluminium	pcs	1	0,036	54	
B1o2-20o12	A113-27078	HAND WHEEL, traversing mechanism	pcs	1	0,500	54	
B1o2-19216	A114-2832	FORK, traversing mechanism joint	pcs	2	0,067	54,52	X
B1o2-20o13	B4-3170	SPINDLE, with bevel gear	pcs	1	0,800	54	
B1o2-19121	A114-19670	SCREW, M 8, length 12 mm, traversing mechanism worm ball bearing retaining nut and spindle with bevel gear lock	pcs	1			
B1o2-20o14	A114-2828	SCREW, M 8, length 29 mm, worm bevel gear fastening	pcs	1	0,020	55	
539 B1o2-19221	A114-2835	SCREW, M 8xo,75, length 9,5 mm, joint fork	pcs	4	0,003	52	X
540 B1o2-20o15	A114-2839	SCREW, M 8, length 16 mm, traversing mechanism casing cover fastening	pcs	4	0,007	55	
541 B1o2-20o16	B4-3167	BEVEL GEAR, traversing mechanism worm	pcs	1	0,100	55	
21000 - EQUILIBRATOR							
542 B1o2-21000	A112-19727	EQUILIBRATOR	set	1		56	
543 B1o2-21001	A994-584	BUSHING, equilibrator spring bronze	pcs	2	0,500	56	
544 B1o2-21008	A114-19724 /SKF-5100/	BALL BEARING, Ø 65/45x14, equilibrator spring bushing nut axial	pcs	2	0,145	56	
545 B1o2-21002	A114-23862	NUT, M 72x2,5, equilibrator spring bushing	pcs	2	0,400	56	
546 B1o2-21003	992-596	SPRING, Ø 68/50, length 420± 30 mm, Ø of wire 9 mm, equilibrator	pcs	2	1,750	56	
547 B1o2-21004	A114-23863	LOCK, equilibrator adjusting screw	pcs	2	0,017	56	
548 B1o2-21005	A114-23694	HEAD, equilibrator wire rope on cradle attaching	pcs	2	0,160	56	
549 B1o2-21006	A114-19725	SCREW, M 4, length 5,5 mm, equilibrator spring bushing nut countersunk lock	pcs	2	0,002	56	

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Signature Number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quant- ity per assembly of the we- apon	Weight per unit in kgs	Fi- gu- re No	No- te
	3	4	5	6	7	8	9
	A114-23864	SCREW, M 5, length 6,8 mm, equili- brator adjusting screw counter- sunk low	pcs	2	0,003		
	A114-19726	EQUILIBRATOR STEEL WIRE ROPE	set	2		56	
	A114-29975	BUSHING, steel wire rope end	pcs	4			
	A114-597	WIRE ROPE, Ø 7x790, steel, with hemp core, with four strands	pcs	2	0,070		
	A114-595	SCREW, M 32x4, length 75 mm, square thread and square recessed dri- ving hole, equilibrator adjus- ting	pcs	2	0,280		
	A114-23693	SCREW, M 25x1,5, equilibrator wire rope on cradle attaching head	pcs	2	0,125		
		b. <u>BOTTON CARRIAGE</u>					
		22000 - AXLE WITH EQUALIZER					
	A111-19120	AXLE WITH EQUALIZER	set	1		60	
		AXLE	set	1		62	
	A114-19684	PIN, Ø 5x30, traversing mechanism toothed sector taper	pcs	3	0,004	62	
	A114-2736	KEY, spring device casing	pcs	4	0,052	62	
	A113-15402	BEARING, Ø 96/85x47, with flange Ø 154, top carriage pivot bronze	pcs	1	1,200	62	
	A114-15394	BEARING, Ø 68/58x36, with flange Ø 76, top carriage pivot bronze	pcs	1	0,300	62	
	A111-19118	AXLE BODY	pcs	1	12,250	62	
	A113-19665	SECTOR, traversing mechanism to- othed bronze	pcs	1	0,700	62	
564	B102-22107	SCREW, M 8, length 30 mm, traversing mechanism toothed sector counter- sunk	pcs	2	0,015	62	
565	B102-22108	SCREW, M 8, length 20 mm, spring device casing key cheese headed	pcs	4	0,010	62	
566	B102-22200	EQUALIZER	set	1		61	
567	B102-22201	EQUALIZER BODY	pcs	2	6,250	61	
568	B102-22202	LOCK BOLT, with handle, right car- riage trail fastening	pcs	1	0,500	61	
569	B102-22203	LOCK BOLT, with handle, left car- riage trail fastening	pcs	1	0,500	61	
570	B102-22204	BEARING BUSHING, Ø 90/80x72, with flange Ø 130, equalizer bar bronze	pcs	1	1,000	61	

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Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
2	3	4	5	6	7	8	9
Ble2-222e5	A994-1487	NUT, M 55x1,5, equalizer bar	pcs	1	1,200	61,62	
Ble2-222e6	A114-2732	SAFETY LOCK, carriage trails fastening lock bolt stop screw	pcs	2	0,017	61	
Ble2-222e7	A994-1486	WASHER, Ø 13e/8x8, equalizer bar nut bronze	pcs	1	0,500	61	
Ble2-222e8	A112-19119	EQUALIZER BAR	pcs	1	11,000	61	
Ble2-222e9	A114-273e	SCREW, M 1e, length 18 mm, with hexagon head, carriage trails fastening lock bolt stop	pcs	2	0,017	61	
Ble2-2221e	A114-2731	SCREW, M 5, length 14,7 mm, carriage trails fastening lock bolt stop screw fixing	pcs	2	0,003	61	
Ble2-22211	A994-1552	SCREW, M 8, length 15 mm, equalizer bar nut lock	pcs	1			
		23000 - CRADLE STAY					
578 Ble2-23000	A112-23785	CRADLE STAY	set	1		63	
Ble2-23100		STAY SUPPORT	set	1		64	
Ble2-231e1	A112-19654	STAY SUPPORT BODY	pcs	1	4,750	64	
581 Ble2-23200	A113-29121	CRADLE STAY SUPPORT CATCH	set	2		64	
582 Ble2-232e1	A114-29213	RING, Ø 1e, cradle stay support catch key chain	pcs	2	0,002		
583 Ble2-232e2	A114-29214	RING, Ø 24, cradle stay support catch key chain	pcs	2	0,004		
584 Ble2-232e3	114-29119	KEY, cradle stay support catch	pcs	2	0,115	64	
585 Ble2-232e4	114-29212	CHAIN, length 112 mm, cradle stay support catch key	pcs	2	0,016	64	
586 Ble2-232e5	114-29211	SPRING, Ø 5,6/4,1, length 25, Ø of wire 0,75 key lock latch	pcs	2	0,001	64	
587 Ble2-232e6	114-44574	LOCK, cradle stay support catch key	pcs	2	0,020	64	
588 Ble2-232e7	A114-19521	PIN, Ø 4x13,5, catch key lock	pcs	2	0,001	64	
589 Ble2-232e8	114-29118	LATCH, key lock	pcs	2	0,003	64	
590 Ble2-23300	A113-19524	CRADLE STAY SHAFT	set	1		64	
591 Ble2-233e1	A114-19525	PIN, Ø 5x23, cradle stay shaft handle	pcs	1	0,002	64	
592 Ble2-233e2	A114-18986	SHAFT BODY	pcs	1	0,500	64	
593 Ble2-233e3	A114-19522	HANDLE, shaft	pcs	1	0,142	64	
594 Ble2-23400	A112-23876	CRADLE STAY	set	1		64	
595 Ble2-234e1		CRADLE STAY BODY	pcs	1	2,140	64	

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
	2	3	4	5	6	7	8	9
	Ble2-234e2		SCREW, M 1e, length 1e mm, cradle stay shaft safety composed of:	pcs	1	0,012	64	
		A114-29224 A114-19863 A114-1986e	1 Screw M 1e 1 Spring ϕ 6/5,3, length 17, ϕ of wire 0,7 mm 1 Ball ϕ 6 mm					
	Ble2-234e3	A114-18985	SCREW, M 8, length 9,5 mm, cradle stay shaft stop	pcs	1	0,004	64	
	Ble2-24000		24000 - CARRIAGE TRAILS					
	Ble2-24100	A111-19963	CARRIAGE TRAILS	set	1			
	Ble2-241e1	A114-19846	CARRIAGE TRAILS - FRONT RIGHT	set	1		59	
	Ble2-241e2	A111-19210	PIN, ϕ 4,2x31, front and rear carriage trail connecting bolt nut taper	pcs	1	0,003	65	X
	Ble2-241e3	A994-792	TRAIL BODY, front right carriage	pcs	1	22,000		
	Ble2-241e4	A114-19843	NUT, M 16, front and rear trail connecting bolt	pcs	1	0,034	65	X
			WASHER, ϕ 32/22,5x2,5, front and rear trail connecting bolt nut elastic	pcs	1	0,009	65	X
604	Ble2-241e5	A993-1126	CONNECTING BOLT, with handle, right front and rear carriage trail	pcs	1	0,335	65	
	Ble2-241e6	B4-22394	TABLE, recoil length, for 4 increments with 6400 ⁰ /oo division	pcs	1	0,090		
	Ble2-241e7	A114-29e22	TABLE, recoil length, for 4 increments with 6400 ⁰ /oo division	pcs	1	0,090		
	Ble2-241e8	A114-2eol4	SCREW, M 3, length 8 mm, recoil length table fastening	pcs	4	0,001		
608	Ble2-242e0	A111-19962	CARRIAGE TRAIL - FRONT LEFT	set	1		59	
609	Ble2-241e1	A114-19846	PIN, ϕ 4,2x31, front and rear carriage trail connecting bolt nut taper	pcs	1	0,003	65	X
610	Ble2-242e1	A114-19847	PIN, ϕ 3,1x14, trails connector locking bolt head taper	pcs	1	0,001	66	
611	Ble2-242e2	A114-23812	HEAD, trails connector locking bolt	pcs	1	0,028	66	
612	Ble2-242e3	A114-19817A	LOCK BOLT, trails connector	pcs	1	0,022	66	
613	Ble2-242e4	A111-19211	TRAIL BODY, front left carriage	pcs	1	23,000	65	
614	Ble2-241e3	A994-792	NUT, M 16, front and rear trail connecting bolt	pcs	1	0,034	65	X
615	Ble2-242e5	A114-19845A	SPRING, ϕ 9,9/8,3, length 24, ϕ of wire 0,8 mm, connector locking bolt	pcs	1	0,002	66	
616	Ble2-242e6	A114-19848	SHAFT, carriage left and right trail connector	pcs	1	0,165	66	
617	Ble2-241e4	A114-19843	WASHER, ϕ 32/22,5x2,5, front and rear trail connecting bolt nut elastic	pcs	1	0,003	65	X

Item No	Nomenclature Number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
2	3		4	5	6	7	8	9
	Ble2-242e7	A993-776	CONNECTING BOLT, with handle, front and rear carriage trail	pcs	1	0,335		
	Ble2-242e8	All3-29233	CONNECTOR, left and right carriage trail	pcs	1	1,100	66	
	Ble2-242e9	All4-292e9	TABLE, weapon inscription	pcs	1	0,045		
	Ble2-242le	A994-794	SCREW, M 1e, length 34 mm, left and right trail connector shaft	pcs	1	0,01e	66	
	Ble2-24211	All4-2921e	SCREW, M 6, length 13 mm, weapon inscription table countersunk	pcs	2	0,004		
	Ble2-243e0	All2-19856	CARRIAGE TRAIL - REAR RIGHT	set	1			
	Ble2-243e1	All14-19854	STOP WASHER, Ø 2e/6,5, thickness 3 mm, bolt wing nut	pcs	1	0,007		
	Ble2-243e2	All3-12e1	STAKE, carriage trail	pcs	1	7,000		X
	Ble2-243e3	All2-19851	CARRIAGE TRAIL BODY, rear right	pcs	1	15,75e		
	Ble2-243e4	All4-1984e	NUT, M 16, carriage trails tail connecting bolt wing	pcs	1	0,092		
	Ble2-243e5	All4-16258	SHAFT, carriage trail tail connecting bolt	pcs	1	0,090		
	Ble2-243e6	All4-170e1	WASHER, Ø 25,3/13, thickness 8 mm, carriage trail tail connecting shaft	pcs	1	0,015		
	Ble2-243e7	A994-965	SCREW BOLT, M 16, carriage trails tail connecting	pcs	1	0,132		
631	Ble2-244e0	All2-19855	CARRIAGE TRAIL - REAR LEFT	set	1		65	
632	Ble2-243e2	All3-12e1	STAKE, carriage trail	pcs	1	7,000		X
633	Ble2-244e1	All2-19839	CARRIAGE TRAIL BODY, rear left	pcs	1	15,500		
			2500e - LUNETTE					
634	Ble2-2500e		LUNETTE	set	1		67	
635	Ble2-250e1	A994-2699	RING, Ø 25, thill fork fastening key handgrip	pcs	1	0,004		
636	B416-250e2	All4-1369	PIN, Ø 2,5x22, thill fork fastening key handgrip	pcs	1	0,002		X
637	Ble2-250e3	A994-1165	KEY, thill fork fastening	pcs	1	0,115		
638	Ble2-250e4	A994-1167	KEY, lunette casing on carriage trails connector fastening	pcs	1	0,200		
639	Ble2-250e5	A994-2697	CHAIN, length 150 mm, with rings lunette casing fastening key	pcs	1	0,02e		
64e	Ble2-250e6	B4-1e773	NUT, M 44x1,5, lunette on casing fastening	pcs	1	0,344	68	
641	Ble2-250e7	All4-192e6	NUT, M 16, lunette hexagon	pcs	1	0,045	68	
642	Ble2-250e8	All3-19218 A994-1158	LUNETTE CASING, with bushing for thill fork	pcs	1	3,15e	68	

Item No.	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the we- apon	Weight per unit in kgs	Fi- gu- re No	No- te
	2	3	4	5	6	7	8	9
	Ble2-25009	B3-10771	LUNETTE	pcs	1	2,000	68	
	Ble2-25010	A994-1160	SPRING, Ø 41/21, length 120, Ø of wire 10 mm, lunette	pcs	1	0,550	68	
	Ble2-25011	A994-1658	RETAINER, Ø of wire 3 mm, lunette casing fastening key	pcs	1	0,012		
	Ble2-25012	B4-10772	RING, lunette spring front bearing steel, with taper	pcs	1	0,070	68	
	Ble2-25013	A994-1161	RING, lunette spring rear bearing	pcs	1	0,070	68	
	Ble2-25014	B4-17783	HANDGRIP, thill fork fastening key	pcs	1	0,088		X
	Ble2-25015	994-1456	SCREW, M 6, length 13 mm, lunette nut M 16 lock	pcs	1	0,002	68	
		All4-29215	SCREW, M 16, length 8 mm, lunette nut M 44x1,5 lock	pcs	1	0,001	68	
			26000 - SPRING DEVICE WITH SPIRAL SPRING-RIGHT FOR WEAPONS TYPE B1 AND B1A1					
	Ble2-8547		SPRING DEVICE WITH SPIRAL SPRING-RIGHT, FOR WEAPONS TYPE B1 AND B1A1.	set	1			
		All4-19124	PIN, Ø 4,1x31, spring device on axle fastening bolt nut taper	pcs	1	0,003	69	
		B4-8388 and All4-1211	BOLT, with handle, spring device blocking right	pcs	1	0,300		
	Ble3-26003	All4-8235	BALL, Ø 5, spring device blocking bolt locking	pcs	1	0,001		X
	Ble3-26004	B2-8548	CASING, right spring device	pcs	1	7,000		
	Ble3-26005	A994-655	BEARING BUSHING, Ø 50/40x15, with flange Ø 60, spring device shaft bronze	pcs	1	0,100	69	X
	Ble3-26006	All4-2761	BEARING BUSHING, Ø 50/40x22, with flange Ø 56, spring device shaft bronze	pcs	1	0,125	69	X
	Ble3-26003	B4-19469	LUBRICATOR composed of 1 Lubricator body 1 Spring 1 Ball	pcs	2	0,003	12	X
659	Ble3-26007	All4-2767	NUT, M 40x1,5, spring device shaft	pcs	1	0,205	69	X
660	Ble3-26008	All4-2851	NUT, M 20x1,5, spring device shaft outer hexagon	pcs	1	0,085	70	X
661	Ble3-26009	All4-19127	NUT, M 16, spring device on axle fastening bolt	pcs	1	0,032	69	X
662	Ble3-26010	All3-2850	SPIRAL SPRING, with 3,1/2 coils, steel strip 60x12 mm	pcs	1	5,700	69	X
663	Ble3-26011	B4-8390	SPRING, Ø 6/4,5, length 13 mm, blocking bolt locking ball	pcs	1	0,001		
664	Ble3-26012	All4-19214	SHAFT, spring device	pcs	1	1,350	69	X

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Item No.	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
	2	3	4	5	6	7	8	9
	B1e3-26e13	A114-12o4	WASHER, ϕ 5o/2o,2 thickness 4 mm, spring device shaft outer nut M 2ox1,5	pcs	1	o,o48	7o	X
	B1e3-26e14	A114-19125	WASHER, ϕ 33/21, thickness 3 mm, spring device on axle fastening bolt nut elastic	pcs	1	o,o11	69	X
	B1e3-26e15	A114-267o	COVER, with thread M 17ox1,5, spring device casing	pcs	1	1,9oo	69	X
	B1e3-26e2o	A114-19213 /DIN-94/	COTTER PIN, ϕ 3,7x43, spring device shaft outer nut M 2ox1,5	pcs	1	o,oo4	7o	X
	B1e3-26e26	A113-2764	FASTENING BOLT, spring device on axle right	pcs	1	o,32o		
	B1e3-26e27	A114-19126	SCREW, M 6, length 16 mm, spring device shaft nut lock	pcs	1	o,oo3	69	X
	B1e3-26e28	A114-12o7	SCREW, M 1o, length 26 mm, spring device blocking bolt stop	pcs	1	o,ol3	71	X
	B1e3-26e29	B4-19864	SCREW, M 5, blocking bolt locking ball spring	pcs	1	o,oo5		X
			27ooo - SPRING DEVICE WITH SPIRAL SPRING-LEFT FOR WEAPONS TYPE B1 AND B1A1					
	B1e3-27ooo	B2-8391	SPRING DEVICE WITH SPIRAL SPRING-LEFT, FOR WEAPONS TYPE B1 AND B1A1	set	1			
	B1e3-26eol	A114-19124	PIN, ϕ 4,1x31, spring device on axle fastening bolt nut taper	pcs	1	o,oo3	69	X
	B1e3-27ool	B4-84o9 and A114-1211	BOLT, with handle, spring device blocking left	pcs	1	o,3oo	71	
	B1e3-27oo3	A114-8235	BALL, ϕ 5, spring device blocking bolt locking	pcs	1	o,ool		X
	B1e3-27oo2	B2-8389	CASING, left spring device	pcs	1	1,35o	71	
	B1e3-26ee5	A994-655	BEARING BUSHING, ϕ 5o/4ox15, with flange ϕ 6o, spring device shaft bronze	pcs	1	o,1oo	69	X
679	B1e3-26ee6	A114-2761	BEARING BUSHING, ϕ 5o/4ox22, with flange ϕ 56, spring device shaft bronze	pcs	1	o,125	69	X
68o	B1e2-12eo3	B4-19469	LUBRICATOR composed of: 1 Lubricator body 1 Spring 1 Ball	pcs	2	o,oo3	12	X
681	B1e3-26eo7	A114-2767	NUT, M 4ox1,5, spring device shaft	pcs	1	o,2o5	69	X
682	B1e3-26eo8	A114-2851	NUT, M 2ox1,5, spring device shaft outer hexagon	pcs	1	o,oo5	7o	X
683	B1e3-26eo9	A114-19127	NUT, M 16, spring device on axle fastening bolt	pcs	1	o,ee2	69	X
684	B1e3-26ele	A113-285e	SPIRAL SPRING, with 3 1/2 coils, steel strip 6ox12 mm	pcs	1	5,7oo	69	X

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Item No	Nomenclature number	Producer's internal reference	DOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
685	B1e3-26e11	B4-339e	SPRING, Ø 6x4,5, length 13 mm blocking bolt locking bolt	pcs	1	0,001		X
686	B1e3-26e12	A114-19214	SHAFT, spring device	pcs	1	1,350	69	X
687	B1e3-26e13	A114-12e4	WASHER, Ø 5e/2e,2, thickness 4 mm, spring device shaft outer nut M 2e1,5	pcs	1	0,048	70	X
688	B1e3-26e14	A114-19125	WASHER, Ø 33/21, thickness 3 mm, spring device on axle fastening bolt nut elastic	pcs	1	0,011	69	X
689	B1e3-26e15	A114-276e	COVER, with thread M 17x1,5 spring device casing	pcs	1	1,900	69	X
690	B1e3-26e2e	A114-19213 /DIN-94/	COTTER PIN, Ø 3,7x43, spring device shaft outer nut M 2e1,5	pcs	1	0,004	70	X
691	B1e3-27e03	A113-278e	FASTENING BOLT, spring device on left axle	pcs	1	0,320	69	
692	B1e3-26e17	A114-19126	SCREW, M 6, length 16 mm, spring device shaft nut M 4e1,5x16 lock	pcs	1	0,003	69	X
693	B1e3-26e18	A114-12e7	SCREW, M 1e, length 26 mm, spring device blocking bolt stop	pcs	1	0,013	71	X
694	B1e3-26e19	B4-19864	SCREW, M 5, blocking bolt locking ball spring	pcs	1	0,005		X

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			28e0e - SPRING DEVICE WITH HELICAL SPRING AND SEMI-AXLE RIGHT, FOR WEAPONS TYPE B1A2, B1A3 AND B1A4					
695	B1e4-28e0e	36-3e-3	SPRING DEVICE WITH HELICAL SPRING AND SEMI-AXLE RIGHT, FOR WEAPONS TYPE B1A2, B1A3 AND B1A4	set	1			
696	B1e4-28e01	34-256-3	WIPER, Ø 35/25x7, spring device spindle pressed felt	pcs	1	0,006		X
697	B1e4-28e02	33-7e-1	WIPER, Ø 93x74x7, semi-axle felt	pcs	1	0,016	74	X
698	B1e3-26e01	A114-19124	PIN, Ø 4,1x31, spring device on axle fastening bolt nut taper	pcs	1	0,003	72	X
699	B1e4-28e04	34-257-7	KEY, right spring device blocking	pcs	1	0,500	72	
700	B1e4-28e05	34-256-4	SEATING BUSHING, spring device spindle bearing		1	0,235	73	X
701	B1e4-28e06	35-259-6	CASING, right spring device	pcs	1	7,350	74	
702	B1e4-28e07	34-256-5	BEARING, spring device spindle spherical bronze	pcs	1	0,092	73	X
703	B1e4-28e08	35-14-3	BEARING BUSHING, Ø 36/3e32, with flange Ø 42, semi-axle smaller bronze	pcs	1	0,082	72	X
704	B1e4-28e09	35-14-5	BEARING BUSHING, Ø 47/41x35, with flange Ø 55, semi-axle bigger bronze	pcs	1	0,122	72	X
705	B1e2-12e03	B4-19469	LUBRICATOR composed of: 1. Lubricator body 1 Spring 1 Ball	pcs	2	0,003	12	X

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
706	B104-28010	35-13-6	NUT, M 92x1,5, spring device casing	pcs	1	1,100	73	X
707	B416-15202	34-187-3	NUT, M 30x1,5, height 19 mm, semi-axle outer octagon	pcs	1	0,115	72	X
708	B104-28011	34-266-3	NUT, M 24x1,5 height 18 mm, semi-axle inner hexagon	pcs	1	0,090	72	X
709	B103-26009	A114-19127	NUT, M 16, spring device on axle fastening bolt	pcs	1	0,033	72	X
710	B104-28013	36-37-3	BUFFER, rubber	pcs	1	0,115	73	X
711	B104-28014	34-256-8	SPRING, Ø 83/53, length 151,5 Ø of wire 15 mm, spring device	pcs	1	0,900	73	X
712	B104-28015	33-70-2	SPRING, Ø 6/4,6, length 18, Ø of wire 0,7 mm, blocking key safety latch	pcs	1	0,001	72	X
713	B104-28016	34-256-7	WASHER, Ø 82/28, thickness 5 mm, spring device casing nut	pcs	1	0,195	73	X
714	B104-28017	34-385-2	WASHER, Ø 42/24,5, thickness 3 mm, inner semi-axle nut	pcs	1	0,022	74	X
715	B103-26014	A114-19125	WASHER, Ø 33/21, thickness 3 mm, spring device on axle fastening bolt nut elastic	pcs	1	0,011	72	X
716	B104-28019	36-37-4	COVER, with thread M 92x1,5, spring device casing	pcs	1	0,700	73	X
717	B104-28020	35-13-7	LEVER, spring device right semi-axle	pcs	1	0,800	73	
718	B104-28021	35-14-4	SEMI-AXLE, right	pcs	1	4,500	73	
719	B104-28022	34-258-0	RING, semi-axle felt wiper retaining	pcs	1	0,500	74	X
720	B416-15207	32-313-0	COTTER PIN, Ø 3,7x60, semi-axle outer nut	pcs	1	0,006	72	X
721	B104-28028	DIN-94	COTTER PIN, Ø 5,7x45, semi-axle inner nut	pcs	1	0,008	72	
722	B104-28023	35-14-1	FASTENING BOLT, right spring device on axle	pcs	1	0,335	72	
723	B104-28024	36-37-2	SPINDLE, spring device	pcs	1	2,000	73	X
724	B104-28025	34-257-4	SCREW, M 5, length 9 mm, spring device casing cover and semi-axle bearing lock	pcs	3	0,003	72	X
725	B104-28026	33-70-5	SCREW, M 9, length 13 mm, spring device blocking key stop	pcs	1	0,005	72	X
726	B104-28027	33-70-3	LATCH, spring device blocking key safety	pcs	1	0,002	72	X
727	B104-29000	36-30-8	29000 - SPRING DEVICE WITH HELICAL SPRING AND SEMI-AXLE-LEFT, FOR WEAPONS TYPE B1A2, B1A3 AND B1A4 SPRING DEVICE WITH HELICAL SPRING AND SEMI-AXLE - LEFT, FOR WEAPONS TYPE B1A2, B1A3 AND B1A4	set	1			

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
728	Ble4-28001	34-256-3	WIPER, ϕ 35/25x7, spring device spindle pressed felt	pcs	1	0,006		X
729	Ble4-28002	33-70-1	WIPER, ϕ 93/74x7, semi-axle felt	pcs	1	0,016	74	X
730	Ble3-26001	A114-19124	PIN, ϕ 4,1x31, spring device on axle fastening bolt nut taper	pcs	1	0,003	72	X
731	Ble4-28004	34-257-7	KEY, left spring device blocking	pcs	1	0,500	72	X
732	Ble4-28005	34-256-4	BUSHING SEATING, spring device spindle bearing	pair	1	0,235	73	X
733	Ble4-29001	35-259-4	CASING, left spring device	pcs	1	0,350		
734	Ble4-28007	34-256-5	BEARING, spring device spindle, spherical bronze	pcs	1	0,092	73	X
735	Ble4-28008	35-14-3	BEARING BUSHING, ϕ 36/30x32, with flange ϕ 42, semi-axle smaller bronze	pcs	1	0,082	72	X
736	Ble4-28009	35-14-5	BEARING BUSHING, ϕ 47/41x35, with flange ϕ 55, semi-axle bigger bronze	pcs	1	0,122	72	X
737	Ble2-12003	B4-19469	LUBRICATOR composed of: 1 Lubricator body 1 Spring 1 Ball	pcs	2	0,003	12	X
738	Ble4-28010	35-13-6	NUT, M 92x1,5, spring device casing	pcs	1	1,100	73	X
739	B416-15202	34-187-3	NUT, M 30x1,5, height 19 mm, semi-axle outer octagon	pcs	1	0,115	72	X
740	Ble4-28011	34-266-3	NUT, M 24x1,5, height 18 mm, semi-axle inner hexagon	pcs	1	0,090	72	X
741	Ble3-26009	A114-19127	NUT, M 16, spring device on axle fastening bolt	pcs	1	0,033	72	X
742	Ble4-28013	36-37-3	BUFFER, rubber	pcs	1	0,115	72	X
743	Ble4-28014	34-256-8	SPRING, ϕ 83/53, length 151,5, ϕ of wire 15 mm, spring device	pcs	1	0,900	73	X
744	Ble4-28015	33-70-2	SPRING, ϕ 6/4,6, length 18, ϕ of wire 0,7 mm, blocking key safety latch	pcs	1	0,001	72	X
745	Ble4-28016	34-256-7	WASHER, ϕ 82/28x5, spring device nut	pcs	1	0,195	73	X
746	Ble4-28017	34-385-2	WASHER, ϕ 42/24,5x3, inner semi-axle nut	pcs	1	0,022	74	X
747	Ble3-26014	A114-19125	WASHER, ϕ 33/21x2, spring device on axle fastening bolt nut elastic	pcs	1	0,011	72	X
748	Ble4-28019	36-37-4	COVER, with thread M 92x1,5 spring device casing	pcs	1	0,700	73	X
749	Ble4-29002	35-14-8	LEVER, spring device left semi-axle	pcs	1	0,800		
750	Ble4-29003	35-15-1	SEMI-AXLE, left	pcs	1	4,500		
751	Ble4-28022	34-258-0	RING, semi-axle felt wiper retaining	pcs	1	0,500	74	X
752	B416-15207	32-313-0	COTTER PIN, ϕ 3,7x60, semi-axle outer nut	pcs	1	0,006	72	X
753	Ble4-28028	DIN-94	COTTER PIN, ϕ 5,7x45, axle inner nut	pcs	1	0,008	72	X

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
754	Ble4-29004	35-14-9	FASTENING BOLT, left spring device on axle	pcs	1	0,335		
755	Ble4-28024	36-37-2	SPINDLE, spring device	pcs	1	2,00	73	X
756	Ble4-28025	34-257-4	SCREW, M 5, length 9 mm, spring device casing cover and semi-axle bearing lock	pcs	3	0,003	72	X
757	Ble4-28026	33-70-5	SCREW, M 9, length 13 mm, spring device blocking key stop	pcs	1	0,005	72	X
758	Ble4-28027	33-70-3	LATCH, Spring device blocking key safety	pcs	1	0,002	72	X
759	Ble3-30000	All1-19435	30000 - WHEEL WITH PNEUMATIC TIRE AND SEMI-AXLE - RIGHT, FOR WEAPONS TYPE B1 AND B1A1	set	1			
760	Ble3-30001	All1-23977	WHEEL WITH PNEUMATIC TIRE AND SEMI-AXLE - RIGHT, FOR WEAPONS TYPE B1 AND B1A1	pcs	1	11,000		X
761	Ble3-30002	All4-19432	WHEEL BODY	pcs	1	0,017	70	X
762	Ble3-30003	All4-19435	WIPER, semi-axle on wheel hub felt	pcs	1	0,017		X
			WIPER, semi-axle felt	pcs	1	0,017		X
763	Ble3-30004	All3-19995	HUB, wheel	pcs	1	4,500	70	X
764	Ble3-30005		TIRE, 6,00 x 16	pos	1	12,500		X
765	Ble3-30006		AIR TUBE	pcs	1	1,900		X
766	Ble3-30007	All4-19953	BLOCKING BOLT, pack transport wheel	pcs	1	0,044	71	X
767	Ble3-30023	34-187-2 /SKF-303-07/	ROLLER BEARING, Ø 80/35, height max 23/min 29,5, radial	pcs	1	0,500	70,75	X
768	Ble3-30024	34-187-1 /SKF-303-10/	ROLLER BRARING, Ø 94/50, height max 29,5/min 29, radial	pos	1	1,200	70	X
769	Ble3-30008	All4-23866	NUT, M 20, wheel hub bolt	pcs	5	0,035	71	X
770	Ble3-30009	All4-8405	BUFFER, spring device rubber	pcs	1	0,030	71	X
771	Ble3-30010	All4-2907	EYE, towing	pcs	1	0,265	71	X
772	Ble3-30011	All4-19956	SPRING, Ø 12,5/10,9, length 25, pack transport wheel blocking key screw	pcs	1	0,004	71	X
773	Ble3-30012	All4-19429	COVER, wheel hub, with thread M 35x1,5	pcs	1	0,255	71	X
774	Ble3-30013	All2-29026	SEMI-AXLE, with spring device blocking key, right	pcs	1	6,600	70	X
775	Ble3-30014	All4-2901	RING, hub protecting bronze, with thread M 112x1,5	pcs	1	0,400	70	X
776	Ble3-30015	All4-194-28	RING NUT, M 50x1,5, semi-axle	pcs	1	1,155	70	X
777	Ble3-30016	All4-23845	HANDGRIP, pack transport wheel blocking key	pcs	1	0,040	71	X

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
778	B416-12300	B4-18843	TIRE VALVE composed of: 1 Valve body 1 Valve needle 1 Valve cap	pcs	1	0,013		X
779	B103-30017	A114-23867	BOLT, M 20, length 46 mm, wheel hub	pcs	5	0,090	71	X
780	B103-30018	A114-2900	SCREW, M 5, hub protecting ring lock	pcs	1	0,002		X
781	B103-30019	A114-2906	SCREW, M 5, length 17,4 mm, hub cover	pcs	1	0,003	71	X
782	B103-30020	A114-2905	SCREW, M 5, length 12 mm, semi-axle ring nut	pcs	1	0,002	70	X
783	B103-30031	A114-19958	SCREW, M6, pack transport wheel blocking key	pcs	1	0,027	71	X
784	B103-30022	A114-8406	SCREW, M 10, spring device rubber buffer	pcs	1	0,025	71	X
			31000 - WHEEL WITH PNEUMATIC TIRE AND SEMI-AXLE - LEFT, FOR WEAPONS TYPE B1 AND B1A1					
785	B103-31000	A111-19435	WHEEL WITH PNEUMATIC TIRE AND SEMI-AXLE - LEFT, FOR WEAPONS TYPE B1 AND B1A1	set	1			

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786	B103-30001	A111-23977	WHEEL BODY	pcs	1	11,000		X
787	B103-30002	A114-19432	WIPER, semi-axle on wheel hub felt	pcs	1	0,017	70	X
788	B103-30003	A114-19435	WIPER, semi-axle felt	pcs	1	0,017		X
789	B103-30004	A113-19995	HUB, wheel	pcs	1	4,500	70	X
790	B103-30005	-	TIRE 6,00 x 16	pcs	1	12,500		X
791	B103-30006	-	AIR TUBE	pcs	1	1,900		X
792	B103-30007	A114-19953	BLOCKING BOLT, pack transport wheel	pcs	1	0,044	71	X
793	B103-30023	34-187-2 /SKF-303-07/	ROLLER BEARING, Ø 80/35, height max 25/min 22,5, radial	pcs	1	0,500	70	X
794	B103-30024	34-187-1 /SKF-303-10/	ROLLER BEARING, Ø 94/50, height max 29,5/min 29, radial	pcs	1	1,200	70	X
795	B103-30008	A114-23866	NUT, M 20, wheel hub bolt	pcs	5	0,035	71	X
796	B103-30009	A114-8405	BUFFER, spring device rubber	pcs	1	0,030	71	X
797	B103-30010	A114-2907	EYE, towing	pcs	1	0,250	71	X
798	B103-30011	A114-19956	SPRING, Ø 12,5/10,9, length 25, pack transport wheel blocking key screw	pcs	1	0,004	71	X
799	B103-30012	A114-19429	COVER, wheel hub, with tread M 35x1,5	pcs	1	0,255	71	X
800	B103-31001	A112-29027	SEMI-AXLE, with spring device blocking key, left	pcs	1	6,600		
801	B103-30014	A114-2901	RING, hub protecting bronze, with thread M 112x1,5	pcs	1	0,400	70	X

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
8e2	B1e3-3ee15	A114-19428	RING NUT, M 5x1,5, semi-axle	pcs	1	0,155	7e	X
8e3	B1e3-3ee16	A114-23845	HANDGRIP, pack transport wheel blocking key	pcs	1	0,040	71	X
8e4	B4e6-123ee	B4-18843	TIRE VALVE, composed of: 1 Valve body 1 Valve needle 1 Valve cap	pcs	1	0,013		X
8e5	B1e3-3ee17	A114-23867	BOLT, M 2e, length 46 mm, wheel hub	pcs	5	0,090	71	X
8e6	B1e3-3ee18	A114-29ee	SCREW, M 5, hub protecting ring lock	pcs	1	0,002		X
8e7	B1e3-3ee19	A114-29e6	SCREW, M 5, length 17 mm, hub cover	pcs	1	0,003	71	X
8e8	B1e3-3ee2e	A114-29e5	SCREW, M 5, length 12 mm, semi-axle ring nut	pcs	1	0,002	7e	X
8e9	B1e3-3ee21	A114-19958	SCREW M 6, pack transport wheel blocking key	pcs	1	0,027	71	X
81e	B1e3-3ee22	A114-84e6	SCREW, M 1e, spring device rubber buffer	pcs	1	0,025	71	X
B416 - 151ee - WHEEL WITH SEMI-ELASTIC TIRE -RIGHT, FOR WEAPONS TYPE BLA2 AND BLA3								

811	B416-151ee	34-21e-8	WHEEL WITH SEMI-ELASTIC TIRE-RIGHT FOR WEAPONS TYRE BLA2 AND BLA3	set	1		59	X
812	B416-151e1	34-379-8	RING, with bolt for pack transport	pcs	2	0,11e		X
813	B1e3-3ee23	34-187-2 /SKF-3e3-e7/	ROLLER BEARING, Ø 8e/35, height max 23/min 22,5, radial	pcs	1	0,500	75	X
814	B1e3-3ee24	34-187-1 /SKF-3e3-1e/	ROLLER BEARING, Ø 94/50, height max 29,5/min 29, radial	pcs	1	1,200	74	X
815	B416-151e2	34-187-9	NUT, M 1e, pack transport ring	pcs	2	0,020		X
816	B416-151e3	34-187-4	NUT, M 42x1,5, hub cover	pcs	1	0,16e	75	X
817	B416-151e4	35-292-7	EYE, towing	pcs	1	0,25e	75	X
818	B416-151e5	34-187-7	WIRE LOCK, Ø 49, Ø of wire 1,5 mm, hub cover nut	pcs	1	0,003	75	X
819	B416-151e6	34-187-4	COVER, towing eye bracket and right hub	pcs	1	0,400	75	
82e	B416-151e7	34-211-3	RING, Ø 93, with tread M 12ex2, hub protecting bronze	pcs	1	0,400	74	X
821	B416-151e8	35-222-7	WHEEL, with semi-elastic tire right aluminium body	pcs	1	26,500	74	
822	B416-151e9	32-313-3	SCREW, M 6, length 13 mm, hub protecting ring and hub cover lock	pcs	2	0,003		X

Item No	Nomenclature number	Producer's internal reference	DENOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
823	B416-16100	34-210-8	B416 - 16100 - WHEEL WITH SEMI ELASTIC TIRE-LEFT, FOR WEAPONS TYPE B1A2 AND B1A3					
824	B416-15101	34-379-9	WHEEL WITH SEMI-ELASTIC TIRE-LEFT, FOR WEAPONS TYPE B1A2 AND B1A3	set	1		59	X
825	B103-30023	34-187-2 /SKF-303-07/	RING, with bolt for pack transport	pcs	2	0,110		X
826	B103-30024	34-187-1 /SKF-303-10/	ROLLER BEARING, Ø 80/35 height max 23/min 22,5 radial	pcs	1	0,500	75	X
827	B416-15102	34-187-9	ROLLER BEARING, Ø 94/50, height max 29,5/min 29 radial	pcs	1	1,200	74	X
828	B416-15103	34-187-6	NUT, M 10, pack transport ring	pcs	2	0,020		X
829	B416-15104	35-292-7	NUT, M 42x1,5, hub cover	pcs	1	0,160	75	X
830	B416-15105	34-187-7	EYE, towing	pcs	1	0,250	75	X
831	B416-16101	34-187-4	WIRE LOCK, Ø 49, Ø of wire 1,5 mm, hub cover nut	pcs	1	0,003	75	X
832	B416-15107	34-211-3	COVER, towing eye bracket and left hub	pcs	1	0,400	75	X
			RING, Ø 93, with thread M 120x2, hub protecting bronze	pcs	1	0,400	74	X

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833	B416-16102	35-222-7	Wheel, with semi-elastic, tire, left aluminium body	pcs	1	26,500	74	
834	B416-15109	32-313-3	SCREW, M 6, length 13 mm, hub protecting ring and hub cover lock	pcs	2	0,003		X
835	B106-32000		32000 - WHEEL WITH PNEUMATIC TIRE RIGHT, FOR WEAPONS TYPE B1A4					
836	B106-32001		WHEEL WITH PNEUMATIC TIRE- RIGHT, FOR WEAPONS TYPE B1A4	set	1			
837	B106-32002	B2-26920	WHEEL BODY	pcs	1	11,000		X
838	B103-30005	-	HUB, with thread M 86x1,5 right	pcs	1			
839	B103-30006	-	TIRE 6,00 - 16	pcs	1	12,500		X
840	B103-30023	34-187-2 /SKF-303-07/	AIR TUBE	pcs	1	1,900		X
841	B103-30024	34-187-1 /SKF-303-10/	ROLLER BEARING, Ø 80/35 height max 23/min 22,5 radial	pcs	1	0,500	75	X
842	B103-30008	A114-23866	ROLLER BEARING, Ø 94/50, height max 29,5/min 29, radial	pcs	1	1,200	74	X
843	B416-15103	34-187-6	NUT, M 20, hub bolt	pcs	5	0,035	71	X
844	B416-15104	35-292-7	NUT, M 43x1,5, hub cover	pcs	1	0,160	75	X
			EYE, towing	pcs	1	0,250	75	X

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Item No	Nomenclature number	Producer's internal reference	DENOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
845	B416-151e5	34-187-7	WIRE LOCK, ϕ 94, ϕ of wire 1,5 mm, hub cover nut	pcs	1	0,003	75	X
846	B1e6-32ee3	-	COVER, towing eye bracket and right hub	pcs	1	0,400		
847	B416-151e7	34-211-3	RING, ϕ 93, with thread M 12x2, hub protecting bronze	pcs	1	0,400	74	X
848	B416-123ee	B4-18843	TIRE VALVE, composed of: 1 Valve body 1 Valve needle 1 Valve cap	pcs	1			X
849	B1e3-3ee17	A114-23867	BOLT, M 2e, length 46 mm, hub	pcs	5	0,090	71	X
850	B416-151e9	32-313-3	SCREW, M 6, length 13 mm, protecting ring and hub cover lock	pcs	2	0,003		X
851	B1e6-33eee	-	33eee - WHEEL WITH PNEUMATIC TIRE-LEFT, FOR WEAPONS TYPE B1A4	set	1			
852	B1e6-32ee1	-	WHEEL WITH PNEUMATIC TIRE-LEFT, FOR WEAPONS TYPE B1A4	pcs	1	11,000		X
853	B1e6-32ee1	B2-2692e	WHEEL BODY	pcs	1			
			HUB, with thread M 86x1,5, left	pcs	1			

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854	B1e3-3ee05	-	TIRE 6.00-16	pcs	1	12,500		X
855	B1e3-3ee06	-	AIR TUBE	pcs	1	1,900		X
856	B1e3-3ee23	34-187-2 /SKP-3e3-e7/	ROLLER BEARING, ϕ 80/35, height max 23/min, 22,5, radial	pcs	1	0,500	75	X
857	B1e3-3ee24	34-187-1 /SKP-3e3-le/	ROLLER BEARING, ϕ 94/50, height max 29,5/min 29, radial	pcs	1	1,200	74	X
858	B1e3-3ee8	A114-23866	NUT, M 2e, hub bolt	pcs	5	0,035	71	X
859	B416-151e3	34-187-6	NUT, M 42/1,5, hub cover	pcs	1	0,160	75	X
860	B416-151e4	35-292-7	EYE, towing	pcs	1	0,250	75	X
861	B416-151e5	34-187-7	WIRE LOCK, ϕ 94, ϕ of the wire 1,5 mm, hub cover nut	pcs	1	0,003	75	X
862	B1e6-33ee2	-	COVER, towing eye bracket and left hub	pcs	1	0,400		
863	B416-151e7	34-211-3	RING, ϕ 93, with thread M 12x2, hub protecting bronze	pcs	1	0,400	74	X
864	B416-123ee	B4-18843	TIRE VALVE, composed of: 1 Valve body 2 Valve needle 3 Valve cap	pcs	1			X
865	B1e3-3ee17	A114-23867	BOLT, M 2e, length 46 mm, hub	pcs	5	0,090	71	X
866	B416-151e9	32-313-3	SCREW, M 6, length 13 mm, protecting ring and hub cover lock	pcs	2	0,003		X

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1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9
			34000 - SHIELD					
867	Ble2-34000	B1-8384	SHIELD	set	1		78	
868	Ble2-34100	-	SHIELD-RIGHT SIDE	set	1		79	
869	Ble2-34101	A114-19386	PIN, ϕ 2x16,5, lower shield and upper shield wing fixing latch handgrip taper	pcs	2	0,001		
870	Ble2-34102	A114-16148	FIXING LATCH, lower shield and upper shield wing	pcs	2	0,032	X	06
871	Ble2-34103	B3-8490	SHIELD WING, lower /only for B1 and B1A1/	pcs	1			
872	Ble4-34103	-	SHIELD WING, lower /only for B1A2, B1A3 and B1A4/	pcs	1	3,700	79	
873	Ble2-34104	B4-8418	SPRING, ϕ 17/10, length 91, ϕ of wire 3,5 mm, lower shield wing shaft right torsion	pcs	1	0,078	79	
874	Ble2-34105	A114-2754	SPRING, ϕ 11,5/9,5, length 59, ϕ of wire 1 mm, lower shield and upper shield wing fixing latch	pcs	1	0,003		X
875	Ble2-34106	B4-8419	SHAFT, ϕ 8x229, lower shield wing	pcs	1	0,088	79	X
876	Ble2-34107	A114-19405	WASHER, ϕ 12,8, thickness 2 mm, lower shield wing shaft steel	pcs	2	0,002	79	X
877	Ble2-34108	A114-19406	CUTTER PIN, ϕ 1,8x15, lower shield wing shaft	pcs	2	0,001	79	X
878	Ble2-34109	A114-16149	HANDGRIP, lower shield and upper shield wing fixing latch	pcs	2	0,042	X	
879	Ble2-34110	A111-19468	SHIELD BODY, right side	pcs	1	6,300	79	
880	Ble2-34200		SHIELD - LEFT SIDE	set	1			
881	Ble2-34101	A114-19386	PIN, ϕ 2x16,5, lower shield and upper shield wing fixing latch handgrip taper	pcs	2	0,001		
882	Ble2-34102	A114-16148	FIXING LATCH, lower shield and upper shield wing	pcs	2	0,032		
883	Ble2-34201	B3-8491	SHIELD WING, lower / only for B1 and B1A1 /	pcs	1			
884	Ble4-34201	-	SHIELD WING, lower /only for B1A2, B1A3 and B1A4 /	pcs	1	3,700	79	
885	Ble2-34202	B4-8416	SPRING, ϕ 17/10, length 91, ϕ of wire 3,5 mm, lower shield wing shaft left torsion	pcs	1	0,078		
886	Ble2-34105	A114-2754	SPRING, ϕ 11,5/9,5, length 59, ϕ of wire 1 mm, lower shield and upper shield wing fixing latch	pcs	2	0,003	X	
887	Ble2-34106	B4-8419	SHAFT, ϕ 8x229, lower shield wing	pcs	1	0,088	79	X

Item No	Nomenclature number	Producer's internal reference	DENOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
888	Ble2-34177	A114-194e5	WASHER, ϕ 13/8, thickness 2 mm, lower shield wing shaft steel	pcs	2	0,002	79	X
889	Ble2-341e8	A114-194e6	COTTER PIN, ϕ 1,8x15, lower shield wing shaft	pcs	2	0,001	79	X
890	Ble2-341e9	A114-16149	HANDGRIP, lower shield and upper shield wing fixing latch	pcs	2	0,042		X
891	Ble2-342e3	A111-19467	SHIELD BODY, left side	pcs	1	6,300		
892	Ble2-342e4	B4-899e	FIRING TABLE, brass	pcs	1	0,090		
893	Ble2-342e5		RIVET, firing table	pcs	4	0,002		
894	Ble2-343e0		MOVABLE PLATE WITH LOCK BOLT	set	1			
895	Ble2-343e1	A114-19225	PIN, ϕ 2,7x21, movable plate lock bolt handgrip taper	pcs	1	0,001		X
896	Ble2-343e2	A114-19394	LOCK BOLT, movable plate	pcs	1	0,020		X
897	Ble2-343e3	A114-2773	SPRING, ϕ 10,5/8,5, length 30, ϕ of wire 1 mm, movable plate lock bolt	pcs	1	0,002		X
898	Ble2-343e4	A113-23733	MOVABLE PLATE	pcs	1	4,100		
899	Ble2-343e5	A994-1166	HANDGRIP, movable plate lock bolt	pcs	1	0,095		

900	Ble2-344e0	A114-20207	SHIELD LOCK BOLT ON LOWER BRACKET	set	1			
901	Ble2-344e1	A994-1671	HEAD, shield lock bolt	pcs	1	0,055		
902	Ble2-343e2	A994-1670	BUSHING, shield lock bolt spring	pcs	1	0,026		
903	Ble2-344e3	A994-1672	LOCK BOLT, shield	pcs	1	0,011		
904	Ble2-344e4	A114-19388	SPRING, ϕ 9/7, length 25, ϕ of wire 1 mm, shield lock bolt	pcs	1	0,008		
905	Ble2-344e5	A114-19399	FORK, shield lock bolt	pcs	1	0,080		
906	Ble2-345e0	A113-19392	SHIELD LEFT AND RIGHT SIDE CONNECTING LINK	set	1			
907	Ble2-343e1	A114-19225	PIN, ϕ 2,7x21, shield left and right side connecting link nut and lock bolt handgrip taper	pcs	2	0,001		X
908	Ble2-343e2	A114-19394	LOCK BOLT, shield left and right side connecting link	pcs	1	0,020		X
909	Ble2-345e1	994-1649	NUT, M 10, shield left and right side connecting link hexagon	pcs	1	0,012		
910	Ble2-343e3	A114-2773	SPRING, ϕ 10,5/8,5, length 30, ϕ of wire 1 mm, shield left and right side connecting link lock bolt	pcs	1	0,002		X
911	Ble2-345e2	A114-19395	SHAFT, shield left and right side connecting link	pcs	1	0,027		
912	Ble2-343e5	994-1166	HANDGRIP, shield left and right side connecting link lock bolt	pcs	1	0,092		

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapons	Weight per unit in kgs	Figure No	No- te
1	2	3	4		6	7	8	9
913	Ble2-345e3	A113-19393	CONNECTING LINK BODY, shield left and right side	pcs	1	0,425		
914	Ble2-346e4	B4-8396	SHIELD BRACKET - UPPER	set	2			
915	Ble2-346e1	114-19422	BUSHING, shield upper bracket /only for B1 /	pcs	2			
916	Ble3-346e1	B4-8395	BUSHING, shield upper bracket /for B1A1, B1A2, B1A3 and B1A4/	pcs	2	0,265		
917	Ble2-346e2	994-1656	NUT, M 12, shield upper bracket bolt hexagon	pcs	2	0,015		
918	Ble2-346e3	A114-19424	BRACKET BODY, shield upper	pcs	2	0,230		
919	Ble2-346e4	A114-194e3	COTTER PIN, Ø 2,7x28, shield upper bracket bolt nut M 12	pcs	2	0,002		
920	Ble2-346e5	A114-19220	RIVET, Ø 5x32, shield upper bracket bushing	pcs	4	0,008		
921	Ble2-346e6	994-1655	BOLT, M 12, length 47,5, shield upper bracket	pcs	2	0,055		
922	Ble3-347e0	B3-8408	SHIELD STAY	set	2			
923	Ble33-347e1	B4-8401 and B4-8404	TUBE, shield stay, with lock bolt bushing	pcs	2	0,500		

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924	Ble3-347e2	B4-8403	PIN, Ø 5x25, shield stay tube	pcs	8	0,004		
925	Ble2-191e3	B4-8406	LOCK BOLT, shield stay	pcs	2	0,020	X	
926	Ble3-347e3	B4-8405	EYE, shield stay	pcs	2	0,215		
927	Ble2-1911e	B4-8407	SPRING, Ø 9,5x6,5, length 32 Ø of wire 1,5 mm, shield stay lock bolt	pcs	2	0,004	X	
928	Ble3-347e4	B4-8399	SHAFT, Ø 8x23,5, shield stay fork and joint	pcs	4	0,010		
929	Ble3-347e5	B4-8402	HANDGRIP, shield stay lock bolt	pcs	2	0,012		
930	Ble3-347e6	B4-8400	FORK, shield stay joint	pcs	4	0,100		
931	Ble3-347e7	B4-8397	JOINT, right shield stay	pcs	1	0,076		
932	Ble3-347e8	B4-8397	JOINT, left shield stay	pcs	1	0,076		
ACCESSORIES								
933	Ble2-35000	A113-29401	STEEL BOTTLE FOR NITROGEN UNDER PRESSURE OF 150 ATMS., CAPACITY 10,1 LITRES	set		20,900	80	BS
934	Ble2-36000	A114-29567	GLASS BOTTLE FOR 2,250 kgs HYDRAULIC BRAKE FLUID	set		3,00	81	BS-1
935	Ble2-37000	A114-29324	COPPER TUBE FOR RECUPERATOR FILLING WITH NITROGEN-LENGTH ABOUT 480 mm	set		0,400	82	BS-2
936	Ble2-37001		COPPER TUBE, Ø 10, with fittings	pcs	1			

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Item No	Nomenclature number	Producer's internal reference	DENOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Notes
1	2	3	4	5	6	7	8	9
937	B1e2-37e02	A114-29235	NUT, W 24,32x1/14 in	pcs	1	0,002	83	WS
938	B1e2-37e03	A114-29237	SEAL, Ø 2e/13, thickness 3 mm, copper tube leather	pcs	2			
939	B1e2-37e04	A114-29239	SCREW, M 22x1,5, copper tube	pcs	1			
940	B1e2-38e00	A113-29159	HAMMER, for carriage trail stake, weight 5 kgs	set				
941	B1e2-385e0	A994-1744	BREECHBLOCK CLEANING BRUSH	set		3,700	85	WS
942	B1e2-39e00	A113-29329	BARREL CLEANER WITH CARTRIDGE DRIVER	set				
943	B1e2-39e01	A114-29229	BUSHING, front cleaner stick	pcs	2			
944	B1e2-39e02	A114-29230	BUSHING, rear cleaner stick	pcs	1			
945	B1e2-39e03	A113-29331	CLEANER BRUSH, wooden with bristles	pcs	1			
946	B1e2-39e04	A114-29227	STICK, front cleaner	pcs	1			
947	B1e2-39e05	A114-29228	STICK, rear cleaner	pcs	1			
948	B1e2-39e06	A114-29328	DRIVER BODY, cartridge	pcs	1			
949	B1e2-39e07	A114-29332	SHAFT, cleaner brush	pcs	1		84	
950	B1e2-39e08	A114-29231	RING, rear cleaner stick	pcs	1		84	

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951	B1e2-39e09	A114-29333	SCREW, M 5, length 12,5 cartridge driver lock	pcs	1		84	
952	B1e2-39e10		SCREW, Ø 3,5x12, wood	pcs	12			
953	B416-52e00	A112-16e51	ARTILLERY LANTERN	set		1,200	83	WS
954	B416-52e01	A112-16e51	LANTERN BODY	pcs	1			
955	B416-52e02	A114-16207	WICK, 23x3, length 130 mm, lantern lighter	pcs	1			
956	B416-52e03	A114-16218	PIN, Ø 2x94, spare glass box cover, iron wire	pcs	1			
957	B416-52e04	A114-16214	COVER, spare glass box	pcs	1			
958	B416-52e05	A114-16252	REFLECTOR, lantern	pcs	1			
959	B416-52e06	A114-16208 and A114-16209	FUEL, receptacle	pcs	1			
960	B416-52e07	A114-16224 and A114-16226	HANDLE, lantern carrying	pcs	1			
961	B416-52e08	-	GLASS, 120x89x2, lantern shutter	pcs	1			
962	B416-52e09	-	GLASS, 98x68x2, lantern sides	pcs	1			
963	B416-52e10	A114-16205	LIGHTER, lantern	pcs	1			
964	B416-52e11	A114-16210	SHUTTER, lantern	pcs	1			
965	B416-52e12	A114-16206	CURTAIN, lantern shutter	pcs	1			
966	B416-52e13	A114-16217	CURTAIN, lantern sides	pcs	1			

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Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly or the weapon	Weight per unit in kg	Wt-gu-re No	No-te
1	2	3	4	5	6	7	8	9
967	B1e2-4e000	A994-1743	HAND EXTRACTOR	set		0,240	83	WS
968	B416-53e00	A114-29249	GUN OIL CAN, CAPACITY 0,5 kg	set		0,150	83	WS
969	B416-531e0	A113-23071	DIESEL FUEL CAN, CAPACITY 1 kg	set		0,550	83	WS
970	B1e2-41e00	A113-29259	DIESEL FUEL CAN, CAPACITY 2 kg	set		0,900	81	BS-1
971	B1e2-411e0	A113-29259	ASKEROL CAN, CAPACITY 2 kg	set		0,900	81	BS-1
972	B1e2-412e0	A113-29259	GUN OIL CAN, CAPACITY 2 kg	set		0,900	81	BS-1
973	B1e2-42e00	A994-2716	PERCUSSION PRIMER WRENCH	set		0,140	83	WS
974	B1e2-421e0	A114-231e1	WRENCH FOR MOUNTING OF FUZE KTM-1 AND FUZE CAP REMOVING	set		0,240	83	WS
975	B1e2-421e1	A114-29173	SPRING, \varnothing 6/4, length 14, \varnothing of wire 1 mm, wrench	pcs	1			
976	B1e2-421e2	A113-29174	SIDE, wrench longer	pcs	1			
977	B1e2-421e3	A114-29172	SIDE, wrench shorter	pcs	1			
978	B1e2-421e4	A114-29171	SCREW, M 6, length 10,5, wrench shaft	pcs	1			
979	B1e2-422e0	1313-25214	WRENCH, for fuze K-451	pcs	1			WS
980	B1e2-423e0		WRENCH, for fuze UPU-M51A5	pcs				WS
981	B416-54e00	A113-29145	TOWING ROPE WITH HOOK	set		2,200	85	WS
982	B416-54e01	A114-29146	HOOK, towing rope	pcs	1			
983	B416-54e02	A113-29126	HEMP ROPE, \varnothing 20, length 6 m	pcs	1			
984	B1e2-44e00	A114-20916	FIRING PIN PROTRUSION GAUGE	set		0,060	83	BS-2
985	B416-532e0	A114-29123	CONTAINER FOR GUN LUBRICANT, CAPACITY 0,5 kg	set		0,150	84	WS
986	B1e2-413e0	A114-29123	CONTAINER FOR GREASE, CAPACITY 0,5 kg	set		0,150	84	WS
987	B1e2-414e0	A114-29253	CONTAINER FOR VASELINE, CAPACITY 0,150 kg	set		0,075	83	BS-1
988	B1e2-415e0	A113-29480	CONTAINER FOR GUN LUBRICANT, CAPACITY 2,300 kg	set		0,050	81	BS-1
989	B1e2-416e0	A113-29480	CONTAINER FOR GUN GREASE, CAPACITY 2,300 kg	set		0,050	81	BS-1
990	B1e2-417e0	A114-29253	CONTAINER FOR GRAPHITIC GREASE, CAPACITY 0,150 kg	set		0,200	83	BS-1
991	B1e2-418e0	A114-29310	WOODEN BOX FOR GLASS BOTTLES	set		0,350	81	BS-1
992	B1e2-45e00	A113-29400	CHEST FOR SIGHTING DEVICE	set			36	
993	B1e2-46e00	A114-29263	POCKET LAMP	set		0,140	83,82	WS, BS-2

Item No	Nomenclature number	Producer's internal reference	DENOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
994	Ble2-46ee1		LAMP BODY, pocket	pcs	1	0,140		
995	Ble2-46ee2		BULB, 2,5 V	pcs	1	0,002	82	
996	Ble2-46ee3	All4-29264	DRY BATTERY	pcs	1			
997	Ble2-419ee	All3-8131	FUNNEL WITH SLIEVE	set		0,125	81	BS-1
998	Ble2-47ee0	All4-29313	PRESSURE GAUGE UP TO 160 ATM	set		0,600	82	BS-2
999	Ble2-48ee0	All4-29395	BARREL CLEANER COVER	set		0,100	85	WS
1000	Ble2-48ee1		COVER BODY, cleaner	pcs	1			
1001	Ble2-48ee2	All4-29396	HEMP CORD, Ø 4, length 550 mm, tying cleaner cover	pcs	1			
1002	Ble2-481ee		COVER for picket	pcs				
1003	Ble2-482ee	All12-214-62	COVER FOR WEAPON FRONT PART	set		0,700	85	WS
1004	Ble2-483ee	All11-214-68	COVER FOR WEAPON REAR PART	set		1,200	85	WS
1005	Ble2-483e1		COVER, fabric	pcs	1			
1006	Ble2-483e2	All4-20798	HEMP CORD, Ø 7 mm, length 2,650 mm, tying cover	pcs	1			
1007	B416-57ee0	All3-29144	HEMP LANYARD, LONG	set		1,100	85	WS
1008	B416-57ee1	All3-29143	HEMP ROPE, Ø 10 mm, length 15 m	pcs	1			
1009	B416-571ee	B4-16687	SNAP HOOK	set				X
1010	B416-572ee	All3-20317	HEMP LANYARD, SHORT	set		0,200	83	WS
1011	B416-572e1	All4-20318	HANDGRIP, lanyard wooden	pcs	1			
1012	B416-572e2	All4-20324	HEMP ROPE, Ø 10 mm, length 1,5 m	pcs	1			
1013	B416-571ee	B4-16687	SNAP HOOK	set	1			X
1014	Ble2-49ee0	36-124-2A and 36-123-2A	PICKET, two parts	set				
1015	Ble2-484ee	All3-29345	CANVAS FOR TOOLS	set			82	BS-2
1016	Ble2-50ee0	All4-16300	LEVEL, loading	set		6,000	85	WS
1017	Ble2-371ee	All4-54194	FLUID DRAINING COUNTER-RECOIL SPEED REGULATOR VALVE COMPRESSOR	set		0,105	82	BS-2
1018	Ble2-372ee	All4-29973	TUBE FITTING FOR RECUPERATOR FILLING WITH NITROGEN	set		0,150	82	BS-2
1019	B416-59ee0	All4-29261	GREASE GUN	set		0,320	83	WS
1020	Ble2-51ee0	All3-29936	PUMP FOR FLUID REFILLING UNDER PRESSURE	set		2,300	82	BS-2
1021	Ble2-51ee1	All4-29443	NUT, M 4x2, pump body bronze	pcs	1			

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Notes
1	2	3	4	5	6	7	8	9
1e22	B1e2-51e02	A114-29450	NUT, M 12x1, pump packing pressing	pcs	1			
1e23	B1e2-51e03	A114-29451	WASHER, packing pressing nut	pcs	1			
1e24	B1e2-51e04	A114-29935	EXTENSION, pump body	pcs	1			
1e25	B1e2-51e05	A114-29446	RING, Ø 30/12, thickness 8 mm, pump packing retaining bronze	pcs	1			
1e26	B1e2-51e06	A113-29439	PUMP BODY	pcs	1			
1e27	B1e2-51e07	A113-29441	THREADED SPINDLE, with actuating lever	pcs	1			
1e28	B1e2-51e08	114-29959A	PACKING, Ø 31,5/11,5, thickness 12 mm pump rubber	pcs	1			
1e29	B1e2-51e09	A114-29445	PACKING, Ø 12,5/6, thickness 3 mm, pump body extension rubber	pcs	1			
1e30	B1e2-51e10	A114-29452	SCREW, M 5, length 17,5, pump packing pressing nut lock	pcs	1			
1e31	B1e2-48500	A113-29265	GLOVE FOR GUN LOADER, RIGHT HAND	set		0,230	83	WS
1e32	B1e2-52000	A111-20486	BOX FOR WEAPON PARTS SET, width 360 mm, length 640 mm, height 245 mm	set			86	
1e33	B1e2-52200	A111-29696	BOX FOR BATTERY PARTS SET No 1, width 360 mm, length 640 mm, height 245 mm	set			87	

1e34	B1e2-52400	A111-29696	BOX FOR BATTERY PARTS SET No 2, width 360 mm, length 640 mm, height 245 mm	set			88	
1e35	B1e2-41950	A114-20815	FLUID MEASURE VESSEL CAPACITY, 0,2 liter	set			89	
1e36	B1e2-48600	A113-29356	TOOL BAG, FABRIC	set			90	
1e37	B1e2-53000	A113-0150	THREE WAY TAP	set			91	
1e38	B1e2-53001	-	THREE WAY TAP BRASS	set			92	
1e39	B1e2-53002	A114-0152	VALVE, M 20x1,5, three way long body horizontal handle	set			93	
1e40	B1e2-53100	A114-0153	THREE WAY VALVE	set			94	
1e41	B1e2-53101	A114-0154	VALVE, M 20x1,5, three way	set			95	
1e42	B1e2-53102	A114-0155	VALVE, three way	set			96	
1e43	B1e2-53103	A114-0156	VALVE, Ø 10/4, thickness 1 mm, three way pressure gauge valve medium	set			97	
1e44	B1e2-53104	-	VALVE, M 20x1,5, three way	set			98	
1e45	B1e2-40500	A114-20804	COMPRESSOR	set			99	
1e46	B1e2-53400	B1492483	ACCESSORIES FOR SUBMERSIBLE TUB BATH THERMISTOR / ONLY FOR 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000					

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
1e47	B1e2-541e0	B4-94e3	CONTAINER, with patches and scraper for tube repair	pcs				
1e48	B1e2-542e0	A113-19466	TIRE MOUNTING AND DISMANTLING LEVER	pcs				
1e49	B1e2-543e0	A113-195e0	TIRE MOUNTING AND DISMANTLING LEVER	pcs				
1e5e	B1e2-55e0e	113-2926e	HAND PUMP FOR TIRES	pcs				
1e51	B1e2-544e0	114-29165	HAND CLIP FOR HOT PATCH VULCANIZATION	pcs				
			ACCESSORIES FOR WEAPON TRANSPORT					
			a/ Accessories for mountain transport					
1e52	B1e2-56e0e	B3-18e36	STRAP, for tying spring device on pack saddle	set		0,070	83	WS
1e53	B416-624e0	B4-18346	STRAP, for tying thill fork-right, length 260 mm	set		0,026	83	WS
1e54	B416-626e0	B4-18352	STRAP, for tying thill for left, length 225 mm	set		0,028	83	WS
1e55	B1e2-561e0	A113-29269	BARREL BEARING FOR PACK-SADDLE-FRONT	set		0,500	83	WS

1e56	B1e2-561e1	A114-29276	PIN, Ø 4x27, wooden pad	pcs	2			X
1e57	B1e2-561e2	A113-29271	BEARING BODY, bronze	pcs	1			
1e58	B1e2-561e3	A114-29273	NUT, M 8, bearing body screw	pcs	1			X
1e59	B1e2-561e4	A114-29277	PAD, wooden	pcs	2			X
1e6e	B1e2-561e5	A114-29274	SCREW, M 8, length 25, bearing body countersunk	pcs	1			
1e61	B1e2-562e0	A113-2927e	BARREL BEARING FOR PACK-SADDLE-REAR	set		0,600	83	WS
1e62	B1e2-561e1	A114-29276	PIN, Ø 4x27, wooden pad	pcs	2			X
1e63	B1e2-562e1	A113-29272	BEARING BODY, bronze	pcs	1			
1e64	B1e2-561e3	A114-29273	NUT, M 8, bearing body screw	pcs	1			
1e65	B1e2-561e4	A114-29277	PAD, wooden	pcs				
1e66	B1e2-562e2	A114-29275	SCREW, M 8, length 25, bearing body countersunk	pcs	1			
1e67	B416-64e0e	B1-22372	FRAME FOR CARRYING PIONEER TOOLS-LEFT	set		3,600	89	
1e68	B416-645e0	B1-22351	FRAME FOR CARRYING PIONEER TOOLS-RIGHT	set		3,150	89	
1e69	B1e2-58e0e	A113-29262	STEEL ROPE WITH SNAP HOOKS FOR BARREL FASTENING ON PACK-SADDLE	set		0,100	83	
1e7e	B1e2-58e01	A113-29279	LINER, steel rope leather	pcs	1			
1e71	B1e2-58e02	A113-29278	STEEL ROPE, Ø 3, length 58e mm	pcs	1			

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4		6	7	8	9
1e47	B1e2-541e0	B4-9403	CONTAINER, with patches and scraper for tube repair	pcs				
1e48	B1e2-542e0	A113-19466	TIRE MOUNTING AND DISMANTLING LEVER	pcs				
1e49	B1e2-543e0	A113-19500	TIRE MOUNTING AND DISMANTLING LEVER	pcs				
1e50	B1e2-55e00	113-29260	HAND PUMP FOR TIRES	pcs				
1e51	B1e2-544e0	114-29165	HAND CLIP FOR HOT PATCH VULCANIZATION	pcs				
			ACCESSORIES FOR WEAPON TRANSPORT					
			a/ Accessories for mountain transport					
1e52	B1e2-56e00	B3-18036	STRAP, for tying spring device on pack saddle	set		0,070	83	WS
1e53	B416-624e0	B4-18346	STRAP, for tying thill fork-right, length 260 mm	set		0,026	83	WS
1e54	B416-626e0	B4-18352	STRAP, for tying thill for left, length 225 mm	set		0,028	83	WS
1e55	B1e2-561e0	A113-29269	BARREL BEARING FOR PACK-SADDLE-FRONT	set		0,500	83	WS

1e56	B1e2-561e1	A114-29276	PIN, Ø 4x27, wooden pad	pcs	2			X
1e57	B1e2-561e2	A113-29271	BEARING BODY, bronze	pcs	1			
1e58	B1e2-561e3	A114-29273	NUT, M 8, bearing body screw	pcs	1			X
1e59	B1e2-561e4	A114-29277	PAD, wooden	pcs	2			X
1e60	B1e2-561e5	A114-29274	SCREW, M 8, length 25, bearing body countersunk	pcs	1			
1e61	B1e2-562e0	A113-29270	BARREL BEARING FOR PACK-SADDLE-REAR	set		0,600	83	WS
1e62	B1e2-561e1	A114-29276	PIN, Ø 4x27, wooden pad	pcs	2			X
1e63	B1e2-562e1	A113-29272	BEARING BODY, bronze	pcs	1			
1e64	B1e2-561e3	A114-29273	NUT, M 8, bearing body screw	pcs	1			
1e65	B1e2-561e4	A114-29277	PAD, wooden	pcs	1			
1e66	B1e2-562e2	A114-29275	SCREW, M 8, length 25, bearing body countersunk	pcs	1			
1e67	B416-64e00	B1-22372	FRAME FOR CARRYING PIONEER TOOLS-LEFT	set		3,600	89	
1e68	B416-645e0	B1-22351	FRAME FOR CARRYING PIONEER TOOLS-RIGHT	set		3,150	89	
1e69	B1e2-58e00	A113-29262	STEEL ROPE WITH SNAP HOOKS FOR BARREL FASTENING ON PACK-SADDLE	set		0,100	83	
1e70	B1e2-58e01	A113-29279	LINER, steel rope leather	pcs	1			
1e71	B1e2-58e02	A113-29278	STEEL ROPE, Ø 3, length 580 mm	pcs	1			

Item No	Nomenclature number	Producer's internal reference	DENOMINATION	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
1e72	B1e- 1100	A114-2928e	WIRE, ϕ 1x16e mm, zinc coated, rope ends tying	pcs	2			
1e73	B416-571e	B4-16687	SWAP HOOK	set	2			
1e74	L-010		UNIVERSAL PACK-SADDLE M-48	set				X
			b/ Accessories for tandem towing					8 pcs for 1 weapon
1e75	B416-66e	B1-1778e	THILL FOR TANDEM TOWING	set		23,7e	9e	
1e76	B416-661e	B1-1778e	THILL FORK	set		12,7e	91	WS
1e77	B416-661e1	A114-1366	RING, trace hook	pcs	2			
1e78	B416-661e2	A994-141e	PIN, ϕ 5,1x58, thill connecting shaft nut taper	pcs	1		91	
1e79	B416-661e3	A994-14e8	NUT, M 36x2, thill connecting shaft	pcs	1		91	
1e8e	B416-661e4	A993-14e9	SHAFT, thill connecting	pcs	1		91	
1e81	B416-661e5	A994-1417	WASHER, ϕ 54, inner hole hexagon, thill connecting shaft bronze	pcs	1		91	
1e82	B416-661e6	A114-19216	WASHER, ϕ 12/6, thickness 1 mm, shaft lubricating hole cover screw M 6	pcs	1		91	
1e83	B416-661e7	A114-19217	COVER, shaft lubricating hole	pcs	1		91	
1e84	B416-661e8	B2-1773e	THILL FORK BODY	pcs	1		91	
1e85	B416-661e9	A994-14e7	SCREW, M 1e, length 2e, thill fastening key position fixing	pcs	1		91	
1e86	B416-6611e	A114-192e7	SCREW, M 6, shaft lubricating hole cover	pcs	1		91	
1e87	B416-662e	B3-17779	THILL - RIGHT	set	1	5,5e	91	
1e88	B416-25e	A114-1369	PIN, ϕ 2,5x22, thill fastening key handgrip	pcs	1			X
1e89	B416-662e1	A114-1367	KEY, thill fastening	pcs	1			
1e9e	B416-25e14	B4-17783	HANDGRIP, thill fastening key	pcs	1			X
1e91	B416-663e	B3-17779	THILL - LEFT	set	1	5,5e	91	
1e92	B416-25e	A114-1369	PIN, ϕ 2,5x22, thill fastening key handgrip	pcs	1			X
1e93	B416-662e1	A114-1367	KEY, thill fastening	pcs	1			
1e94	B416-25e14	B4-17783	HANDGRIP, thill fastening key	pcs	1			X
1e95	L-101		HARNESS FOR TANDEM TOWING M-47	set				
			SPECIAL TOOLS					
1e96	B1e2-59e	A114-29958	BUSHING, recuperator fluid refilling	pcs		0,37e	92	EE-2

1e6

Item No	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the weapon	Weight per unit in kgs	Figure No	Note
1	2	3	4	5	6	7	8	9
1097	B102-59002	A114-20936	WRENCH, breechblock operating handle circular box cover	pcs		0,480	92	BS-2
1098	B102-59003	A114-23020A	WRENCH, socket with square hole 7x7 mm, recuperator valve and recoil brake fluid refilling valve plug T and air vent plug V	pcs		0,085	92	BS-2
1099	B102-59004	A114-54193	WRENCH, single-ended 27 mm, counter recoil speed adjusting	pcs		0,370	83,92	WS
1100	B102-59005	B4-14974	WRENCH, double-ended hook, for counterrecoil piston rod nut 19279, counterrecoil piston rod nut lock nut 8083 and counterrecoil speed regulator valve nut 8051	pcs		0,090	93	
1101	B102-59006	A114-19462	WRENCH, double-ended hook, for recoil brake rear stuffing box packing retaining nut 8072, spring device on axle fastening bolt nut 19127 and front and rear carriage trail connecting bolt nut 792	pcs		0,140	92	
1102	B102-59007	A114-23975	WRENCH, double-ended with lugs, for recoil brake front stuffing box packing retaining nut 16111 and packing ring nut 8016	pcs		0,155	92	
1103	B102-59008	A114-8312	WRENCH, adjustable fork pin smaller	pcs		0,195	92	
1104	B102-59009	A114-8312	WRENCH, adjustable fork pin bigger	pcs		0,600	92	
1105	B102-59010	A113-20214	WRENCH, socket with lugs, for recoil brake stuffing box 8014, recuperator stuffing box 8046 and counterrecoil speed regulator 23877	pcs		1,200	92	
1106	B102-59011	A113-23959	WRENCH, socket with lugs, for traversing mechanism worm ball bearing nut 2829 and counterrecoil speed regulator packing nut 29294	pcs		0,200	92	
1107	B102-59012	B3-17652	WRENCH, socket with lugs, recuperator and recoil brake piston rod connector nuts 8107 and 8108, recoil brake rear stuffing box packing retaining bearing nut 8072 recuperator cylinder jointing nut 8115 and recoil brake rear stuffing box 8068	pcs		1,000	92	
1108	B102-59013	A114-29908	WRENCH, socket hexagon, for recuperator cylinder 8117, recuperator valve body 23948 and compensator cylinder stuffing box 29915	pcs		1,700	92	
1109	B102-59014	A113-29365	WRENCH, for adjusting and removing floating piston	pcs		2,200	92	
1110	B102-59015	A114-29306	WRENCH, square 17x17, for equilibrating adjusting	pcs		0,500	92	

Item no	Nomenclature number	Producer's internal reference	D E N O M I N A T I O N	Unit	Quantity per assembly of the we- apon	Weight per unit in kgs	Fi- gu- re No	No- te
1	2	3	4	5	6	7	8	9
1111	B1e2-59e16	A114-29812	WRENCH, socket with lugs, recupera- tor and recoil brake piston rod connector nuts 81e7 and 81e8, re- coil brake rear stuffing box pac- king retaining bearing nut 8e72, recuperator cylinder jointing nut 8115 and the hexagon side for wheel hub nut/only for B1A1 and B1A2/	pcs		0,700	92	
1112	B1e2-59e17		WRENCH, socket hexagon, for compen- sator body nut 2e169	pcs		1,350	92	
1113	B416-5e12	B4-183e8	WRENCH, hook, for wheel hub cover	pcs			92	
1114	B1e2-59e18		WRENCH, socket, for spring device shaft nut 2767 /only for B1A1/	pcs				
1115	B1e2-59e19		WRENCH, fork, for lunette nut 1e773	pcs				
1116	B1e2-59e20		WRENCH, hook, equalizer bar nut 1487	pcs		0,600	92	
1117	B1e2-59e21		WRENCH, single-ended 60 mm, top carriage pivot nut	pcs		1,750	92	
1118	B1e2-59e22	A114-8427	LEVER, ϕ 14,5x400 mm, socket wrench turning	pcs		0,600	92	

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1119	B1e2-60000	A112-29316	FIXTURE FOR EQUALIBRATOR ASSEMBLING AND DISMANTLING	set		4,00	92	
1120	B1e2-60001	A114-29325	PIN, ϕ 8x57 mm, with, rounded ends, threaded spindle nut	pcs	1			
1121	B1e2-60002	A114-29323	PIN, ϕ 6x42, threaded spindle head	pcs	1			
1122	B1e2-60003	A114-29320	GUIDE, threaded spindle	pcs	1			
1123	B1e2-60004	A114-29318	BEARING BUSHING, ϕ 54/38, height 29, with flange ϕ 64 mm threaded spin- dle nut bronze	pcs	1			
1124	B1e2-60005	A114-29321	NUT, with handle, threaded spindle	pcs	1			
1125	B1e2-60006	A113-29327	FIXTURE BODY, equilibrator assembling and disassembling	pcs	1			
1126	B1e2-60007	A114-29319	THREADED, spindle with hook	pcs	1			

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REMARK

THE WHEELS FOR MOUNTAIN GUN 76 mm M 48 B1A1-I IN RELATION TO MODEL B1 HAVE THE FOLLOWING PRODUCER'S INTERNAL REFERENCE:

	B-1	B1A1-I
WHEEL ASSEMBLY	A111 - 19435	B-1 - 26953
HUB	29028	B-2 - 26920
PLATE	113 - 23980	113 - 23980 A
PLATE	113 - 23835	113 - 23835 A
LUG - TOWING	114 - 2907	35 - 292-7
COVER	114 - 19429	34 - 187-6

All other parts of the wheel are the same regardless to which of these two models they adhere

REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS

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7. REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS

This register serves to determine the quantity of built-in parts in the weapon as a complete unit for the case when one of the same parts is in more assemblies ie. subassemblies. The parts which are not entered in the register are in the weapon in quantities which are shown in the assembly ie. subassembly of the respective part.

Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B1o2-12o03	76 mm Mountain Gun M 48 B1, B1A1, B1A2, B1A3 and B1A4 LUBRICATOR, composed of 1 spring 1 ball 1 lubricator-body	pcs	17	12,46, 199,526, 658,68o	
B1o2-12o08	SCREW, M 6x1, for slides, bronze, special	pcs	22	17, 48	
B1o2-145o6	PIN, Ø 3x2o, trigger shaft lifter lever pawl taper	pcs	2	11o, 17o	
B1o2-1453o	COTTER PIN, auxiliary triggering handle shaft	pcs	2	137, 178	
B1o2-16o09	SCREW, M 4, length 12 mm, compensator spring cover	pcs	5	239, 369	
B1o2-161o7	SCREW, M 1o, length 3o mm, cradle Trunnion fastening	pcs	12	247, 256	
B1o2-172o8	JOINTING, Ø 37/19 thickness 8,5 mm recuperator piston rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	2	278, 297	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B1o5-172o8	JOINTING, Ø 37,5/18,5 Thickness 8,5 mm recuperator piston rubber /only for B1A3 and B1A4 from No 31o3/	pcs	2	278, 308	
B1o2-175o7	PACKING, Ø 31/13 mm Thickness 8 mm recuperator cylinder stuffing box rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	4	3oo, 358	
B1o5-175o7	PACKING, Ø 31,5/12,5 mm Thickness 8 mm, recuperator cylinder stuffing box rubber /only for B1A3 from No 31o3 and B1A4/	pcs	4	3o1, 359	
B1o6-175o7	PACKING, Ø 31,5/14,5 mm thickness 7 mm, recuperator cylinder stuffing box rubber /only for B1A3 and B1A4 from No 31o3 /	pcs	2	3o2	
B1o2-177o9	PACKING, Ø 49/31 mm thickness 8 mm, floating piston rubber /only for B1, B1A1, B1A2 and B1A3 up to No 31o2/	pcs	4	328,4o8, 442	
B1o5-177o9	PACKING, Ø 5o/3o,5 mm thickness 9 mm, floating piston rubber /only for B1A3 and B1A4 from No 31o1/	pcs	4	329,4o9, 443	
B1o2-184o6	RING, Ø 57/52 mm thickness 2 mm, hydraulic brake stuffing box copper	pcs	2	396, 4o7	
B1o2-191o1	PIN, Ø3x26 mm, elevating wheel	pcs	2	466,52o	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
Elo2-19103	LOCK BOLT, front wheel casing fastening mounting pack screws, etc.	pcs	5	466,925	
Elo2-19104	SPRING BUSHING, 8 x 10 mm, length 10 mm, with flange 2 mm, elevating mechanism, axle and wheel shaft device	pcs	6	471,505	
Elo2-19105	SPRING BOLT, with casing fastening screw, etc.	pcs	3	475,907	
Elo2-19106	SCREW, M 8, length 12 mm, front wheel shaft nut device	pcs	4	486,513	
Elo2-19107	PIV, 8 x 10, mm, elevating mechanism joint fork	pcs	4	484,515	
Elo2-19108	SAW, 8 x 10, elevating mechanism joint	pcs	2	495,522	
Elo2-19109	PIV, elevating mechanism joint	pcs	4	505,535	
Elo2-19110	SCREW, M 8x8, 75 mm length, 9,5 mm joint fork	pcs	8	514,539	
Elo2-24101	PIV, 8 x 10, front and rear carriage connecting bolt nut taper	pcs	2	600,609	
Elo2-24103	PIV, M 16, front and rear trail connecting bolt	pcs	2	602,614	
Elo2-24104	WASHER, 8 12/22x2,5, front and rear trail connecting bolt nut elastic	pcs	2	603,617	
Elo2-24302	STAKE, carriage trail	pcs	2	625,632	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
Elo2-25002	PIV, 8 x 10, front wheel fastening key and screw	pcs	3	606,1088, 1092	
Elo2-25014	PIV, 8 x 10, front wheel fastening key	pcs	3	608,1090, 1094	
Elo3-26001	PIV, 8 x 10, spring device on axle fastening bolt nut taper	pcs	4	652,674, 698,730	
Elo3-26003	PIV, 8 x 10, spring device blocking bolt locking	pcs	2	654,676	
Elo3-26005	BEARING BUSHING, 8 50/40x15, with flange 8 60, spring device shaft device	pcs	2	656,678	
Elo3-26006	BEARING BUSHING, 8 50/40x22, with flange 8 60, spring device shaft device	pcs	2	657,679	
Elo3-26007	PIV, M 16x1,5, spring device shaft	pcs	2	659,681	
Elo3-26008	PIV, M 16x1,5, spring device shaft outer hexagon	pcs	2	660,682	
Elo3-26009	PIV, M 16, spring device on axle fastening bolt	pcs	4	661,683 709,741	
Elo3-26010	SPIRAL SPRING, 3 1/2 coils, steel strip 60x12 mm	pcs	2	662,684	
Elo3-26012	SHAFT, spring device	pcs	2	664,686	
Elo3-26013	WASHER, 8 50/20,2, thickness 4 mm, spring device shaft outer nut M 20x1,5	pcs	2	665,687	
Elo3-26014	WASHER, 8 33/21, thickness 3 mm, spring device on axle fastening bolt nut elastic	pcs	4	666,688, 715,747	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
Blo2-191o3	LOCK BOLT, hand wheel casing fastening /duringpack transport	pcs	3	468,925	
Blo2-191o6	BEARING BUSHING, Ø 21/15 mm, Length 16 mm with flange Ø 27 mm, elevating mechanism spindle and wheel shaft bronze	pcs	6	471,525	
Blo2-1911o	SPRING, hand wheel casing fastening lock bolt	pcs	3	475,927	
Blo2-19121	SCREW, M 8, length 12 mm hand wheel shaft nut lock	pcs	4	486,513 537	
Blo2-192o2	PIN, Ø 3x25 mm, elevating mechanism joint fork	pcs	4	494,519	
Blo2-192o3	BAL, Ø 2o, elevating mechanism joint	pcs	2	495,522	
Blo2-19216	FORK, elevating mechanism joint	pcs	4	5o9,535	
Blo2-1922o	SCREW, M 8xo,75 mm length 9,5 mm joint fork	pcs	8	514,539	
Blo2-241o1	PIN, Ø 4,2x31, front and rear carriage connecting bolt nut taper	pcs	2	6oo,6o9	
Blo2-241o3	NUT, M 16, front and rear trail connecting bolt	pcs	2	6o2,614	
Blo2-241o4	WASHER, Ø 32/22x2,5, front and rear trail connecting bolt nut elastic	pcs	2	6o3,617	
Blo2-243o2	STAKE, carriage trail	pcs	2	625,632	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B416-25oo2	PIN, Ø 2,5x22 thill fork fastening key hand grip	pcs	3	636, 1o88, 1o92	
Blo2-25o14	HANDGRIP, thill fork fastening key	pcs	3	648,1o9o, 1o94	
Blo3-26oo1	PIN, Ø 4,1x31, spring device on axle fastening bolt nut taper	pcs	4	652,674, 698,73o	
Blo3-26oo3	BALL, Ø 5, spring device blocking bolt locking	pcs	2	654,676	
Blo3-26oo5	BEARING BUSHING, Ø 5o/4ox15, with flange Ø 6o, spring device shaft bronze	pcs	2	656,678	
Blo3-26oo6	BEARING BUSHING, Ø 5o/4ox22, with flange Ø 6o, spring device shaft bronze	pcs	2	657,679	
Blo3-26oo7	NUT, M 4ox1,5, spring device shaft	pcs	2	659,681	
Blo3-26oo8	NUT, M 2ox1,5, spring device shaft outer hexagon	pcs	2	66o,682	
Blo3-26oo9	NUT, M 16, spring device on axle fastening bolt	pcs	4	661,683 7o9,741	
Blo3-26olo	SPIRAL SPRING, 3 1/2 coils, steel strip 6ox12 mm	pcs	2	662,684	
Blo3-26o12	SHAFT, spring device	pcs	2	664,686	
Blo3-26o13	WASHER, Ø 5o/2o,2, thickness 4 mm, spring device shaft outer nut M 2ox1,5	pcs	2	665,687	
Blo3-26o14	WASHER, Ø 33/21, thickness 3 mm spring device on axle fastening bolt nut elastic	pcs	4	666,688, 715,747	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
Blo3-26o15	COVER, with thread M 17x1,5 mm, spring device casing	pcs	2	667,689	
Blo4-28o28	COTTER PIN, ϕ 3,7x43, spring device shaft outer nut	pcs	2	668,69o	
Blo3-26o17	SCREW, M 6, length 16 mm spring device shaft nut lock	pcs	6	67o,692	
Blo3-26o18	SCREW, M 1o, length 26 mm spring device blocking bolt stop	pcs	2	671,693	
Blo3-26o19	SCREW, M 5, blocking bolt locking ball spring	pcs	2	672,694	
Blo4-28o01	WIPER, ϕ 35/25x7, spring device spindle pressed felt	pcs	2	696,728	
Blo4-28o02	WIPER, ϕ 93x74x7, semi-axle felt	pcs	2	697,729	
Blo4-28o04	KEY, right spring device blocking	pcs	2	699,731	
Blo4-28o05	SEATING BUCHING, spring device spindle bearing	pcs	2	7oo,732	
Blo4-28o07	BEARING, SPRING device spindle spherical bronze	pcs	2	7o2,734	
Blo4-28o08	BEARING BUCHING, ϕ 36/3o x32, with flange ϕ 42, semi-axle smaller bronze	pcs	2	7o3,735	
Blo4-28o09	BEARING BUSHING, ϕ 47/41x35, with flange ϕ 55, semi-axle bigger bronze	pcs	2	7o4,736	
Blo4-28o1o	NUT, M 92x1,5, spring device casing	pcs	2	7o6,738	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
Blo4-152o2	NUT, M 3ox1,5, height 19 mm semi-axle outer octagon	pcs	2	7o7,739	
Blo4-28o11	NUT, M 24x1,5, height 18 mm, semi-axle inner hexagon	pcs	2	7o8,74o	
Blo4-28o13	BUFFER, rubber	pcs	2	71o,742	
Blo4-28o14	SPRING, ϕ 83/53, length 151,5 mm, ϕ of wire 15 mm spring device	pcs	2	711,743	
Blo4-28o15	SPRING, ϕ 6/4,6, length 18 mm, wire ϕ o,7 mm, blocking key safety latch	pcs	2	712,744	
Blo4-28o16	WASHER, ϕ 82/25, thickness 5 mm, spring device casing nut	pcs	2	713,745	
Blo4-28o17	WASHER, ϕ 42/24,5, thickness 3 mm, inner semi-axle nut	pcs	2	714,746	
Blo4-28o19	COVER, with thread M 92x1,5 spring device casing	pcs	2	716,748	
Blo4-28o22	RING, semi-axle felt wiper retaining	pcs	2	719,751	
Blo4-152o7	COTTER PIN, ϕ 3,7x6o, semi-axle outer nut	pcs	2	72o,752	
Blo4-28o28	COTTER PIN, ϕ 5,7x45, semi-axle inner nut	pcs	2	721,753	
Blo4-28o24	SPINDLE, spring device	pcs	2	723,755	
Blo4-28o25	SCREW, M 5, length 9 mm, spring device casing cover and semi-axle bearing lock	pcs	6	724,756	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B104-28026	SCREW, M 9, length 13 mm, spring device blocking key stop	pcs	2	725,757	
B104-28027	LATCH, spring device blocking key safety	pcs	2	726,758	
B103-30001	WHEEL BODY	pcs	2	760,786	
B103-30002	WIPER, semi-axle on wheel hub felt	pcs	2	761,787	
B103-30004	HUB, wheel	pcs	2	763,789	
B103-30005	TIRE, 6.00x16	pcs	2	764,790, 838,854	
B103-30006	AIR TUBE	pcs	2	765,791, 839,855	
B103-30007	BLOCKING BOLT, pack transport wheel	pcs	2	766,792	
B103-30023	ROLLER BEARING, Ø 80/35, height max 23,5/min 22,5 mm, radial	pcs	6	767,793 813,825, 840,856	
B103-30024	ROLLER BEARING, Ø 94/50, height max 29,5/min 29, radial	pcs	6	768,794, 814,826, 841,857	
B103-30008	NUT, M 20, wheel hub bolt	pcs	20	769,795 842,858	
B103-30009	BUFFER, spring device rubber	pcs	2	770,796	
B103-30010	EYE, towing	pcs	2	771,797	
B103-30011	SPRING, Ø 12,5/10,9, length 25 mm, pack transport blocking key screw	pcs	2	772,798	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B103-30012	COVER, wheel hub, with thread M 35x1,5	pcs	2	773,799	
B103-30014	RING, hub protecting bronze with thread M 112x1,5	pcs	2	775,801	
B103-30015	RING NUT, M 50x1,5, semi-axle	pcs	2	776,802	
B103-30016	HANDGRIP, pack transport wheel blocking key	pcs	2	777,803	
B416-12300	TIRE VALVE, composed of: 1 valve body 1 valve needle 1 valve cap	pcs	4	778,804, 848,864	
B103-30017	BOLT, M 20, length 46 mm, wheel hub	pcs	20	779,805, 849,865	
B103-30018	SCREW, M 5, hub protecting ring lock	pcs	2	780,806	
B103-30019	SCREW, M 5, length 17,4 mm, hub cover	pcs	2	781,807	
B103-30020	SCREW, M 5, length 12 mm, semi-axle ring nut	pcs	2	782,808	
B103-30021	SCREW, M 6, pack transport wheel blocking key	pcs	2	783,809	
B103-30022	SCREW, M 10, spring device rubber buffer	pcs	2	784,810	
B416-15101	RING, with bolt for pack transport	pcs	4	812,824	
B416-15102	NUT, M 10, pack transport ring	pcs	4	815,827	
B416-15103	NUT, M 42x1,5, hub cover	pcs	4	816,828, 843,859	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B416-151e4	EYE, towing	pcs	4	817,829, 844,860	
B416-151e5	WIRE LOCK, Ø 49, Ø of wire 1,5 mm, hub cover nut	pcs	4	818,830, 845,861	
B416-151e7	RING, Ø 93, with thread M 12x2 hub protecting bro	pcs	4	820,832, 847,863	
B416-151e9	SCREW, M 6, length 13 mm, hub protecting ring and cover lock	pcs	6	822,834, 850,866	
B1e6-32e02	HUB, with thread M 86x1,5, right	pcs	2	837,853	
B1e2-341e1	PIN, Ø 2x16,8, lower shield and upper shield wing fixing latch handgrip taper	pcs	4	869,881	
B1e2-341e2	FIXING LATCH, lower shield and upper shield wing	pcs	4	870,882	
B1e2-341e5	SPRING, Ø 11,5/9,5, length 59 mm, Ø of wire 1 mm, lower shield and upper shield wing fixing latch	pcs	4	874,886	
B1e2-341e6	SHAFT, Ø 8x229, lower shield wing	pcs	2	875,887	
B1e2-341e7	WASHER, Ø 13/8, thickness 2 mm lower shield wing shaft steel	pcs	4	876,888	
B1e2-341e8	COTTER PIN, Ø 1,8x15 mm lower shield wing shaft	pcs	4	877,889	
B1e2-341e1	PIN, Ø 2,7x21, movable plate jack belt handgrip taper	pcs	3	895,907	
B1e2-341e2	WASHER, movable plate	pcs	2	896,908	
B1e2-341e3	SPRING, Ø 11,5/9,5, length 59 mm, Ø of wire 1 mm, movable plate jack belt	pcs	2	897,910	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B416-151e4	EYE, towing	pcs	4	817,829, 844,860	
B416-151e5	WIRE LOCK, Ø 49, Ø of wire 1,5 mm, hub cover nut	pcs	4	818,830, 845,861	
B416-151e7	RING, Ø 93, with thread M 120x2 hub protecting bronze	pcs	4	820,832, 847,863	
B416-151e9	SCREW, M 6, length 13 mm, hub protecting ring and cover lock	pcs	6	822,834, 850,866	
B1e6-32e02	HUB, with thread M 86x1,5, right	pcs	2	837,853	
B1e2-341e1	PIN, Ø 2x16,8, lower shield and upper shield wing fixing latch handgrip taper	pcs	4	869,881	
B1e2-341e2	FIXING LATCH, lower shield and upper shield wing	pcs	4	870,882	
B1e2-341e5	SPRING, Ø 11,5/9,5, length 59 mm, Ø of wire 1 mm, lower shield and upper shield wing fixing latch	pcs	4	874,886	
B1e2-341e6	SHAFT, Ø 8x229, lower shield wing	pcs	2	875,887	
B1e2-341e7	WASHER, Ø 13/8, thickness 2 mm lower shield wing shaft steel	pcs	4	876,888	
B1e2-341e8	COTTER PIN, Ø 1,8x15 mm lower shield wing shaft	pcs	4	877,889	
B1e2-343e1	PIN, Ø 2,7x21, movable plate lock bolt handgrip taper	pcs	3	895,907	
B1e2-343e2	LOCK BOLT, movable plate	pcs	2	896,908	
B1e2-343e3	SPRING, Ø 10,5/8,5, length 30, Ø of wire 1 mm, movable plate lock bolt	pcs	2	897,910	

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Nomenclature number	DENOMINATION	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
B416-571e0	SNAP HOOK	pcs	4	1009,1013 1073	
B1e2-561e1	PIN, Ø 4x27, wooden pad	pcs	4	1056,1062	
B1e2-561e3	NUT, M 8, bearing body screw	pcs	2	1058,1064	
B416-25014	HANDGRIP, thill fastening key	pcs	2	648,1094 1090	

**REGISTER OF PRODUCER'S INTERNAL
REFERENCES**

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8. REGISTER OF PRODUCER'S INTERNAL REFERENCES

This register serves for quick identification of parts when only the producer's internal reference is known. The number of drawings of all weapon parts, accessories and tools are listed in a chronological order starting from the smallest number toward the largest number.

Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A110-19550	16		A112-19679	465	
A111-2813	496		A112-19683	523	
A111-19118	562		A112-19720	40	
A111-19120	556		A112-19727	542	
A111-19210	601		A112-19839	633	
A111-19211	613		A112-19851	626	
A111-19435	759,785		A112-19855	631	
A111-19467	891		A112-19856	623	
A111-19468	879		A112-19986	1	
A111-19526	9		A112-20010	567	
A111-19699	182		A112-20155	180	
A111-19721	63		A112-21462	1003	
A111-19837	492		A112-23785	578	
A111-19962	608		A112-23876	594	
A111-19963	599		A112-27183	233	
A111-19587	4		A112-29026	774	
A111-20486	1032		A112-29027	800	
A111-21468	1004		A112-29316	1119	
A111-23977	760,786		A113-1201	625,632	
A111-29696	1033, 1034		A113-2764	669	
A112-0117	260		A113-2780	691	
A112-16081	953,954		A113-2814	503	
A112-19119	574		A113-2850	662,684	
A112-19654	580		A113-2866	160	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A113-2867	155		A113-19835	506	
A113-8002	389		A113-19836	504	
A113-8005	267		A113-19995	763,789	
A113-8006	316		A113-19997	568	
A113-8007	290		A113-19998	569	
A113-8093	435		A113-20020	460	
A113-8096	243		A113-20214	1105	
A113-8103	380		A113-20317	1010	
A113-8131	997		A113-23071	969	
A113-8150	1037		A113-23733	898	
A113-8239	461		A113-23773	372	
A113-8246	459		A113-23774	373	
A113-8414	463		A113-23851	184	
A113-15402	560		A113-23858	35	
A113-16256	382		A113-23877	354	
A113-16257	386		A113-23877A	355	
A113-16286	240		A113-23887	82	
A113-19215	318		A113-23948	304	
A113-19215A	319		A113-23959	1106	
A113-19218	642		A113-27078	534	
A994-1158			A113-27176	191	
A113-19383	143		A113-29121	581	
A113-19392	906		A113-29126	983	
A113-19393	913		A113-29143	1008	
A113-19427	153		A113-29144	1007	
A113-19466	1048		A113-29145	981	
A113-19500	1049		A113-29159	940	
A113-19524	590		A113-29174	976	
A113-19665	563		A113-29233	619	
A113-19678	484		A113-29259	970,971,972	
A113-19696	470		A113-29262	1069	
A113-19714	204		A113-29265	1031	
A113-19716	54		A113-29269	1055	
A113-19731	130		A113-29270	1061	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A113-29271	1057		A114-2773	897,910	
A113-29272	1063		A114-2789	26	
A113-29278	1071		A114-2793	34	
A113-29279	1070		A114-2794	39	
A113-29327	1125		A114-2797	32	
A113-29329	942		A114-2798	33	
A113-29331	945		A114-2799	31	
A113-29345	1015		A114-2801	38	
A113-29356	1036		A114-2805	86	
A113-29365	1109		A114-2806	84	
A113-29400	992		A114-2807	30	
A113-29401	933		A114-2808	85	
A113-29439	1026		A114-2820	466,520	
A113-29441	1027		A114-2821	471,525	
A113-29480	988,989		A114-2822	532	
A113-29936	1020		A114-2823	531	
A114-302	96		A114-2827	521	
A114-303	97		A114-2828	538	
A114-1204	665,687		A114-2829	527	
A114-1207	671,693		A114-2830	517	
A114-1301	64		A114-2831	495,522	
A114-1366	1077		A114-2832	509,535	
A114-1367	1089,1093		A114-2835	514,539	
A114-1369	636,1088, 1092		A114-2839	540	
A114-2730	575		A114-2849	508	
A114-2731	576		A114-2851	660,682	
A114-2732	572		A114-2862	564	
A114-2735	565		A114-2864	146	
A114-2736	559		A114-2900	780,806	
A114-2754	874,886		A114-2901	775,801	
A114-2760	667,689		A114-2905	782,808	
A114-2761	657,679		A114-2906	781,807	
A114-2767	659,681		A114-2907	771,797	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A114-8009	400		A114-8042A	329,409,443	
A114-8012	392		A114-8043	326	
A114-8014	390		A114-8043A	327	
A114-8016	393		A114-8044	320	
A114-8016A	394		A114-8044A	321	
A114-8017	391		A114-8045	293	
A114-8019	414		A114-8045	294	
A114-8020	422		A114-8046	291	
A114-8020A	423		A114-8047	300,358	
A114-8022	429		A114-8047A	301,359	
A114-8023	430		A114-8048	297	
A114-8023A	431		A114-8048A	298	
A114-8024	438		A114-8049	292	
A114-8024A	439		A114-8050	295	
A114-8025	433		A114-8050A	296	
A114-8026	277		A114-8051	344	
A114-8027	273		A114-8060	350	
A114-8028	274		A114-8060A	351	
A114-8029	269		A114-8062	367	
A114-8029A	270		A114-8065	349	
A114-8031	278,397		A114-8067	404	
A114-8031A	279,398		A114-8067A	405	
A114-8032	275		A114-8068	401	
A114-8032A	276		A114-8068A	402	
A114-8033	271		A114-8070	410	
A114-8034	268		A114-8071	403	
A114-8035	323		A114-8072	406	
A114-8036	317		A114-8078	309	
A114-8037	324		A114-8079	314	
A114-8039	325		A114-8080	307	
A114-8040	331		A114-8081	315	
A114-8040A	332		A114-8083	449	
A114-8041	322		A114-8084	263	
A114-8042	328,408,442		A114-8085	268	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
ALL4-8086	419		ALL4-8293	254	
ALL4-8087	396,407		ALL4-8294	250	
ALL4-8097	247,256		ALL4-8295	249	
ALL4-8098	387		ALL4-8312	1103,1104	
ALL4-8101	377		ALL4-8405	770,796	
ALL4-8104	378		ALL4-8406	784,810	
ALL4-8106	379		ALL4-8427	1118	
ALL4-8107	288		ALL4-15394	561	
ALL4-8108	287		ALL4-16109	36	
ALL4-8109	284		ALL4-16111	395	
ALL4-8110	281		ALL4-16119	218	
ALL4-8111	285		ALL4-16148	870,882	
ALL4-8112	283		ALL4-16149	878,890	
ALL4-8114	299		ALL4-16205	963	
ALL4-8115	261		ALL4-16206	965	
ALL4-8116	264		ALL4-16207	955	
ALL4-8122	239,369		ALL4-16208	959	
ALL4-8123	234		ALL4-16209		
ALL4-8152	1039		ALL4-16210	964	
ALL4-8154	1042		ALL4-16214	957	
ALL4-8155	1041		ALL4-16217	966	
ALL4-8230	1043		ALL4-16218	956	
ALL4-8231	1040		ALL4-16224	960	
ALL4-8235	654,676		ALL4-16226		
ALL4-8241	450		ALL4-16252	958	
ALL4-8242	454		ALL4-16258	628	
ALL4-8243	456		ALL4-16297	399	
ALL4-8244	447		ALL4-16298	245	
ALL4-8247	452,453		ALL4-16300	1016	
ALL4-8248	451		ALL4-16509	231	
ALL4-8252	446		ALL4-16510	235	
ALL4-8254	445		ALL4-17001	629	
ALL4-8259A	266		ALL4-18985	597	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
ALL4-18986	592		ALL4-19001	877,889	
ALL4-19114	7		ALL4-19024	918	
ALL4-19115	2		ALL4-19428	776,802	
ALL4-19116	5		ALL4-19429	773,799	
ALL4-19124	652,674,698, 730		ALL4-19432	761,787	
ALL4-19125	666,688,715, 747		ALL4-19435	762	
ALL4-19126	670,692		ALL4-19436	52	
ALL4-19127	661,683,709, 741		ALL4-19448	51	
ALL4-19206	641		ALL4-19462	1101	
ALL4-19207	1086		ALL4-19501	244	
ALL4-19213	668,690		ALL4-19502	246	
ALL4-19214	664,686		ALL4-19503	242	
ALL4-19216	1082		ALL4-19504	241	
ALL4-19217	1083		ALL4-19521	588	
ALL4-19220	920		ALL4-19522	593	
ALL4-19225	895,907		ALL4-19525	591	
ALL4-19279	448		ALL4-19527	21	
ALL4-19280			ALL4-19531	15	
ALL4-19375	113		ALL4-19547	28	
ALL4-19376	115		ALL4-19548	24	
ALL4-19379	108		ALL4-19652	220	
ALL4-19380	95		ALL4-19653	205	
ALL4-19381	107		ALL4-19661	533	
ALL4-19384	106		ALL4-19662	530	
ALL4-19386	869,881		ALL4-19668	478	
ALL4-19388	904		ALL4-19669	482	
ALL4-19394	896,908		ALL4-19670	486,513,537	
ALL4-19395	911		ALL4-19671	473	
ALL4-19399	905		ALL4-19672	474	
ALL4-19403	919		ALL4-19682	518	
ALL4-19405	876,888		ALL4-19684	558	
			ALL4-19685	186	
			ALL4-19687	203	
			ALL4-19689	222	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A114-8086	419		A114-8293	254	
A114-8087	396,407		A114-8294	250	
A114-8097	247,256		A114-8295	249	
A114-8098	387		A114-8312	1103,1104	
A114-8101	377		A114-8405	770,796	
A114-8104	378		A114-8406	784,810	
A114-8106	379		A114-8427	1118	
A114-8107	288		A114-15394	561	
A114-8108	287		A114-16109	36	
A114-8109	284		A114-16111	395	
A114-8110	281		A114-16119	218	
A114-8111	285		A114-16148	870,882	
A114-8112	283		A114-16149	878,890	
A114-8114	299		A114-16205	963	
A114-8115	261		A114-16206	965	
A114-8116	264		A114-16207	955	
A114-8122	239,369		A114-16208	959	
A114-8123	234		A114-16209		
A114-8152	1039		A114-16210	964	
A114-8154	1042		A114-16214	957	
A114-8155	1041		A114-16217	966	
A114-8230	1043		A114-16218	956	
A114-8231	1040		A114-16224	960	
A114-8235	654,676		A114-16226		
A114-8241	450		A114-16252	958	
A114-8242	454		A114-16258	628	
A114-8243	456		A114-16297	399	
A114-8244	447		A114-16298	245	
A114-8247	452,453		A114-16300	1016	
A114-8248	451		A114-16509	231	
A114-8252	446		A114-16510	235	
A114-8254	445		A114-17001	629	
A114-8259A	266		A114-18985	597	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	4	5	6
A114-18986	592		A114-19406	877,889	
A114-19114	7		A114-19424	918	
A114-19115	2		A114-19428	776,802	
A114-19116	5		A114-19429	773,799	
A114-19124	652,674,698, 730		A114-19432	761,787	
A114-19125	666,688,715, 747		A114-19435	762	
A114-19126	670,692		A114-19436	52	
A114-19127	661,683,709, 741		A114-19448	51	
A114-19206	641		A114-19462	1101	
A114-19207	1086		A114-19501	244	
A114-19213	668,690		A114-19502	246	
A114-19214	664,686		A114-19503	242	
A114-19216	1082		A114-19504	241	
A114-19217	1083		A114-19521	588	
A114-19220	920		A114-19522	593	
A114-19225	895,907		A114-19525	591	
A114-19279	448		A114-19527	21	
A114-19280			A114-19531	15	
A114-19375	113		A114-19547	28	
A114-19376	115		A114-19548	24	
A114-19379	108		A114-19652	220	
A114-19380	95		A114-19653	205	
A114-19381	107		A114-19661	533	
A114-19384	106		A114-19662	530	
A114-19386	869,881		A114-19668	478	
A114-19388	904		A114-19669	482	
A114-19394	896,908		A114-19670	486,513,537	
A114-19395	911		A114-19671	473	
A114-19399	905		A114-19672	474	
A114-19403	919		A114-19682	518	
A114-19405	876,888		A114-19684	558	
			A114-19685	186	
			A114-19687	203	
			A114-19689	222	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A114-19690	221		A114-19827	510	
A114-19695	487		A114-19828	505	
A114-19697	483		A114-19829	500	
A114-19700	228		A114-19830	498	
A114-19702	219		A114-19831	499	
A114-19706	189		A114-19833	497	
A114-19707	214		A114-19840	627	
A114-19708	195		A114-19843	603,617	
A114-19709	208		A114-19845A	615	
A114-19715	61		A114-19846	600,609	
A114-19717	56		A114-19847	610	
A114-19718	57		A114-19848	616	
A114-19723	50		A114-19854	624	
A114-19724	544		A114-19863		
A114-19725	549		A114-19860		
A114-19726	551		A114-29225	236	
A114-19729	134		A114-19860		
A114-19730	171		A114-19863		
A114-19732	109		A114-29224	593	
A114-19733	111		A114-19932	118	
A114-19734	110,170		A114-19946	117	
A114-19735	112		A114-19953	766,792	
A114-19736	137,178		A114-19956	772,798	
A114-19737	141		A114-19958	783,809	
A114-19738	200		A114-19992	8	
A114-19814	55		A114-19994	149	
A114-19817A	612		A114-19999	145	
A114-19818	515		A114-20014	607	
A114-19819	502		A114-20016	229	
A114-19820	493		A114-20017	434	
A114-19822	494,519		A114-20024	455	
A114-19823	512		A114-20028	437	
A114-19824	511		A114-20029	457	
A114-19825	501		A114-20033	114	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A114-20169	432		A114-23867	779,805,849,	
A114-20171	436			865	
A114-20172	440		A114-23874	3	
A114-20172A	441		A114-23878	357	
A114-20186	252		A114-23880	368	
A114-20187	428		A114-23883	92	
A114-20204	1045		A114-23884	59	
A114-20207	900		A114-23935	282	
A114-20318	1011		A114-23941	458	
A114-20324	1012		A114-23949	306	
A114-20798	1006		A114-23950	311	
A114-20815	1035		A114-23951	308	
A114-20916	984		A114-23953	312	
A114-20936	1097		A114-23953A	313	
A114-23020A	1098		A114-23975	1102	
A114-23101	974		A114-27074	237,238	
A114-23204	161		A114-27080	529	
A114-23693	555		A114-28860	212	
A114-23694	548		A114-29022	606	
A114-23735	257		A114-29023	18	
A114-23736	251		A114-29029	19	
A114-23775	374		A114-29123	985,986	
A114-23776	375		A114-29125	6	
A114-23812	611		A114-29146	982	
A114-23845	777,803		A114-29171	978	
A114-23854	60		A114-29172	977	
A114-23855	20		A114-29173	975	
A114-23857	227		A114-29175	198	
A114-23860	390		A114-29176	190	
A114-23862	545		A114-29209	620	
A114-23863	547		A114-29210	622	
A114-23864	550		A114-29213	582	
A114-23866	769,795,842,		A114-29215	650	
	858		A114-29227	946	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A114-29228	947		A114-29436	310	
A114-29229	943		A114-29443	1021	
A114-29230	944		A114-29445	1029	
A114-29231	950		A114-29446	1025	
A114-29234	935		A114-29450	1022	
A114-29235	937		A114-29451	1023	
A114-29237	938		A114-29452	1030	
A114-29239	939		A114-29537	1105	
A114-29249	968		A114-29567	934	
A114-29253	987,990		A114-29631	1031	
A114-29261	1019		A114-29632	1032	
A114-29263	993		A114-29633	1037	
A114-29264	996		A114-29637	1038	
A114-29273	1058,1064		A114-29640	1042	
A114-29274	1060		A114-29644	1041	
A114-29275	1066		A114-29651	1039	
A114-29276	1056,1062		A114-29652	1040	
A114-29277	1059,1065		A114-29654	1035	
A114-29280	1072		A114-29655	1036	
A114-29306	1110		A114-29812	1111	
A114-29310	991		A114-29908	1108	
A114-29313	998		A114-29914	411	
A114-29318	1123		A114-29915	416	
A114-29319	1126		A114-29916	421	
A114-29320	1122		A114-29918	426	
A114-29321	1124		A114-29919	415	
A114-29323	1121		A114-29920	420	
A114-29325	1120		A114-29921	424	
A114-29328	948		A114-29923	425	
A114-29332	949		A114-29935	1024	
A114-29333	951		A114-29953	417	
A114-29395	999		A114-29956	418	
A114-29396	1001		A114-29958	1096	
A114-29435	788		A114-29973	1018	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A114-29975	552		A994-597	553	
A114-29999	77		A994-632	528	
A114-30000	76		A994-655	656,678	
A114-34193	1099		A994-697	144	
A114-34194	1017		A994-792	602,614	
A115-16263	384		A994-794	621	
A115-16295	232		A994-883	507	
A993-335	133		A994-919	524	
A993-359	163		A994-945	102	
A993-360	98		A994-965	630	
A993-776	618		A994-976	154	
A993-1126	604		A994-977	162	
A993-1409	1080		A994-978	168	
A994-328	69,70		A994-980	166	
A994-329	74		A994-1015	10,11	
A994-330	80		A994-1065	27	
A994-331	75		A994-1086	78	
A994-332	72		A994-1086A	79	
A994-333	73		A994-1095	90	
A994-334	71		A994-1096	87	
A994-338	99		A994-1097	83	
A994-339	125		A994-1098	91	
A994-340	105		A994-1100	89	
A994-342	124		A994-1132	135	
A994-354	123		A994-1133	128	
A994-355	164		A994-1134	136	
A994-356	103		A994-1137	142	
A994-358	129		A994-1142	127	
A994-383	148		A994-1143	140	
A994-384	116		A994-1144	132	
A994-385	138		A994-1146	126	
A994-386	101		A994-1150	167	
A994-504	543		A994-1152	175	
A994-595	554		A994-1153	173	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
A994-1160	644		B1-10250	67	
A994-1161	647		B1-17780	1075, 1076	
A994-1165	637		B1-22169	183	
A994-1166	899		B1-22351	1068	
A994-1167	638		B1-22372	1067	
A994-1176	1748		B2-8389	677	
A994-1185	172		B2-8391	673	
A994-1186	174		B2-8413	181	
A994-1187	176		B2-8547	651	
A994-1189	177		B2-8548	655	
A994-1407	1085		B2-17730	1084	
A994-1408	1079		B2-26920	837, 853	
A994-1410	1078		B3-8408	922	
A994-1411	88		B3-8490	871	
A994-1417	1081		B3-8491	883	
A994-1486	573		B3-8589	192	
A994-1487	571		B3-10771	643	
A994-1488	570		B3-10936		
A994-1552	577		B3-17652	1107	
A994-1658	645		B3-17779	1087, 1091	
A994-1670	902		B3-18036	1052	
A994-1671	901		B4-3167	541	
A994-1672	903		B4-3168	477	
A994-1743	967		B4-3170	536	
A994-1744	941		B4-4202	185	
A994-2697	639		B4-8381	122	
A994-2699	635		B4-8383		
A994-2710	147		B4-8388	653	
A994-2712	152		A114-1211		
A994-2716	973		B4-8390	663, 685	
A11-8559	383		B4-8395	916	
B0-22171	194		B4-8396	914	
B1-8384	867		B4-8397	931, 932	
B1-8394	193		B4-8399	928	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
B4-8400	930		B4-17658	469	
B4-8401	923		B4-17783	648, 1094	
B4-8404			B4-18308	1113	
B4-8402	929		B4-18346	1053	
B4-8403	924		B4-18352	1054	
B4-8405	926		B4-18843	778, 804, 848, 864	
B4-8406	468, 925				
B4-8407	475, 927		B4-19469	12, 46, 199, 526, 658, 680, 705, 737	
B4-8409	675				
A114-1211					
B4-8411	119		B4-19864	672, 694	
B4-8412	131		B4-22394	605	
B4-8416	885		B4-26934	302, 605	
B4-8418	873		32-313-0	720, 752	
B4-8419	875, 887		32-313-3	822, 834, 850, 866	
B4-8990	892				
B4-9403	1046, 1047		33-70-1	697, 729	
B4-10279	340		33-70-2	712, 744	
B4-10280	341		33-70-3	720, 758	
B4-10281	356		33-70-5	725, 757	
B4-10772	646		33-330-8	1044	
B4-10773	640		33-243-8	1041	
B4-11243	463		34-187-1	768, 794, 814, 826, 841, 857	
B4-13009	139				
B4-14974	1100		34-187-2	767, 793, 813, 825, 840, 856	
B4-16687	1009, 1013, 1073				
B4-17385	479		34-187-3	707-739	
B4-17653	480		34-187-4	819, 828, 831	
B4-17654	491		34-187-5	816-828-843, 859	
B4-17655	489				
B4-17656	490		34-187-7	818, 830, 845, 861	
B4-17657	485		34-187-9	815, 827	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
34-210-8	811,823		36-124-2A	1014	
34-211-3	820,832,847, 863		110-20054	47	
			111-20040	444	
34-256-3	696,728		111-29091	153	
34-256-4	700,732		112-8323	248	
34-256-5	702,734		112-29925	333	
34-256-7	713,745		112-23861	66	
34-256-8	711,743		113-29260	1050	
34-257-4	724,756		113-29933	348	
34-257-7	699,731		114-1252	206	
34-258-0	719,751		114-2792	13	
34-266-3	708,740		114-2817	476	
34-379-8	812,824		114-2838	481	
34-385-2	714,746		111-2840	467	
35-2-A1	1046		114-2845	488	
35-13-6	706,738		114-2847	472	
35-13-7	717		114-8052	347	
35-14-1	721		114-8053	370	
35-14-3	703,735		114-8061	338	
35-14-4	718		114-8113	353	
35-14-5	704-736		114-8116	264	
35-14-8	749		114-8259	265	
35-14-9	754		114-8259A	266	
35-15-1	750		114-10282	352	
35-227-7	821,833		114-16255	385	
35-259-4	733		114-16756	364	
35-259-6	701		114-16756A	365	
35-292-7	817,829,844, 860		114-19422	915	
			114-19528	14	
36-30-3	695		114-20053	303	
36-30-8	727		114-20061	224	
36-37-2	723,755		114-20062	42,43	
36-37-3	710,742		114-20063	44,45	
36-37-4	716,748		114-29078	210	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
114-29118	589		993-1180	179	
114-29119	584		993-1246	216,217	
114-29165	1051		994-585	196,197	
114-29201	388		994-586	188	
114-29205	255		994-587	215	
114-29211	586		994-588	187	
114-29212	585		994-589	207	
114-29214	583		994-591	226	
114-29241	211		994-615	151	
114-29291	342		994-616	150	
114-29291A	343		994-785	213	
114-29294	336		994-1013	25	
114-29294A	337		994-1060	223	
114-29437	304		994-1099	93	
114-29465	37		994-1101	209	
114-29917	412		994-1145		
114-29917A	413		994-1244	121	
114-29926	339		994-1166	912	
114-29928	362		994-1456	649	
114-29928A	363		994-1549	909	
114-29929	366		994-1055	421	
114-29932	360		994-1056	417	
114-29932A	361		994-2515	225	
114-29934	334		994-2516	201	
114-29934A	335		994-2519	202	
114-29954	346		1313-25214	379	
114-29959A	1028				
114-29960	345				
114-29962	289				
114-44574	587				
992-596	546				
992-2709	157,158				
993-695	159				
993-1064	23				

LIST OF INTRODUCED CHANGES

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9. LIST OF INTRODUCED CHANGES

Changes and additions are entered in the list of introduced change on the basis of the order of the Ordnance department

Number of change	Order Ordnance department for the change and number of the article in the nomenclature	Where the change is performed			Date and signature of the person who has performed the change
		On which page	Which line		
			From above	From below	
1	2	3	4	5	6

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Number of change	Order Ordonance department for the change and number of the article in the nomenclature	Where the change is performed			Date and signature of the person who has performed the change
		On which page	Which line		
			From above	From below	
1	2	3	4	5	6

Restricted

MOUNTAIN GUN

76 mm M48 B1, B1A1 B1A2, B1A3 and B1A4

**RANGE QUADRANT DB-1, PANORAMIC TELESCOPE M57,
GUNNER'S QUADRANT M50 AND LIGHTING ACCESSORIES PO-2**

BOOK III

NOMENCLATURE

Restricted

50X1-HUM

Page Denied

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INTRODUCTION

1. SCOPE

The book TS-III for the range quadrant DB-1, panoramic telescope M57, gunner's quadrant M50 and lighting accessories PO-2 for the mountain gun 76 mm M48 B1, B1A1, B1A2, B1A3 and B1A4 contains the data for all component parts of these devices and serves for identification, storage and issue of parts and the devices as a unit.

The book TS-III for instruments forms an integral part of the book TS-III for the mountain gun 76 mm M48 B1-B1A4.

Data about the weights in column 7 of the nomenclature can be used for all needs at planning, transport and storage. It should be taken into account that the weights are net weights where the weight of preservation and packing is not included.

2. EXPLANATION OF THE HEADINGS

Column No. 1 "ITEM NUMBER" is used for the register of the producer's internal references and the register of the nomenclature numbers of same parts.

Column No. 2 "NOMENCLATURE NUMBER" contains the marking of the basic mean (for example C391) and the part number (for example 12109) and serves for evidence, storage and ordering of parts.

Column No. 3 "PRODUCER'S INTERNAL REFERENCE", contains the internal producer's reference according to which the respective part is produced. It is used for establishing-identification of the part and for ordering the part from the producer. For quick identification of parts when only the producer's internal referen-

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ces are known, as an appendix to the nomenclature, the "REGISTER OF THE PRODUCER'S INTERNAL REFERENCES", is given.

Column No. 4 "DENOMINATION". All component parts of the range quadrant DB-1, panoramic telescope M57, gunner's quadrant M50 and accessories PO-2 are listed in assemblies and subassemblies. The assemblies represent a physical and functional unit of all means (for example: angle of site mechanism, elevation angle mechanism) and such assemblies are divided into subassemblies withholding the principle of a physical and functional unit (for example, the angle of site mechanism level).

In certain cases the assemblies do not have subassemblies and the component parts are listed directly in an alphabetic order of names (for example: G391-14000 FASTENER, PANORAMIC TELESCOPE).

The names of the parts are written stepwise toward the right in the manner that the names of the assemblies and subassemblies and most characteristic nouns of the parts are written in capital letters and the remaining descriptive part of the name is written with normal small letters.

The names are written stepwise toward the right, so that for the first step (assembly) and the second step (subassembly) the name is written in capital letters, and for the third step (part) only the most characteristic noun is written in capital letters and the remaining descriptive part of the name is written with normal small letters. Exceptionally certain small subassemblies where the component parts can not or normally are not disassembled are shown as a part, and the component parts of these are given as the fourth step (for example: grease cup).

Column No. 5 "Unit". Depending of the kind of the material the unit is given in: pieces, sets and similar.

Column No. 6 "QUANTITY OF PARTS PER ASSEMBLY-SUBASSEMBLY", shows the quantity of respective parts built-in one assembly

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respectively subassembly. If a part is in two or more assemblies respectively subassemblies then such part carries the nomenclature number of the assembly respectively subassembly where it first time appeared. Such parts are marked with marking "X" in column 9 of the nomenclature. In how many assemblies respectively subassemblies such part appears and how many of such parts are built-in the device, that can be seen in the "REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS". The quantities of parts in an assembly-subassemblies represent at the same time also the quantities of parts in the complete technical mean, if they are not designated with "X" in the column NOTE and are not in the register of the nomenclature numbers of same parts.

Column No. 7 "WEIGHT OF PARTS PER UNIT IN GRAMS". This column gives the data for net weights of the parts without preservation and packing.

Column No. 8 "FIGURE NUMBER". This column shows the number of the figure in the nomenclature where the respective part can be seen.

Column No. 9 "NOTE". In this column, the parts which reappear in more assemblies respectively subassemblies, are designated with "X". Also other remarks important for certain items of the nomenclature are entered in this column.

3. ABBREVIATIONS AND MARKINGS

The following abbreviations and markings are used in this book:

Abbreviation	Meaning
Ø	diameter
Øm	mean diameter
mm	millimeter
kg	kilogram
lg	length

w	width
pcs	pieces
set	set
v	volt

Markings

- X the part appears in more assemblies respectively subassemblies (at which item number it appears and how many of the same are in the mean, can be seen in the register of nomenclature numbers of same parts).
- OK Weapon set (spare parts, tools and accessories).
- 1/6000 .. Angle division made according to the division of the circle into 6000 mils.
- 1/6400 .. Angle division made according to the division of the circle into 6400 mils.

4. — NOMENCLATURE OF THE RANGE
QUADRANT DB-1 PARTS

Item Nº	Nomenclature number	Producer's internal reference	Denomination	Unit	Quantity of parts per as- sembly	Weight per unit in gr.	Fig. Nº	Note
1	2	3	4	5	6	7	8	9
	C391	33-243-8	RANGE QUADRANT "DB-1" FOR MOUNTAIN GUN 76 mm M48 B1, B1A1, B1A2, B1A3 and B1A4				93 -95	
			10000 - BODY, RANGE QUADRANT					
1	C391-10000	-	BODY, RANGE QUADRANT	set	1	-	-	
2	C391-10001	33-244-9	RANGE QUADRANT, body	pcs	1	965	97	
3	C391-10002	33-243-9	COVER, range quadrant body	pcs	1	130	99	
4	C391-10003	33-244-0	SCREW M 3,5, range quadrant cover, length 12 mm	pcs	6	1	99	
			11000 - MECHANISM, ELEVATION ANGLE					
5	C391-11000	33-248-9	MECHANISM, ELEVATION ANGLE	set	1	-	-	
6	C391-11100	33-248-9	MECHANISM, ELEVATION ANGLE MECHANISM	set	1	-	-	
7	C391-11101	33-250-0	PIN, worm, taper, \varnothing 2 x 14 mm	pes	2	0,5	96	
8	C391-11102	33-244-4	SCALE, elevation angle mechanism	pcs	1	3	99	
9	C391-11103	33-249-0	WORM WHEEL, elevation angle mechanism	pcs	1	418	97	
10	C391-11104	33-249-3	BEARING, elevation angle mechanism, internal	pcs	1	12	96	
11	C391-11105	33-249-5	BEARING, elevation angle mechanism, external	pcs	1	10	96	
12	C391-11106	33-249-9	BRACKET, elevation angle mechanism scale, internal	pcs	1	22	96	

13	C391-11107	33-250-1	BRACKET, elevation angle mechanism scale, external	pcs	1	25	96	
14	C391-11108	33-250-2	MICROMETER, elevation angle mechanism	pcs	1	135	96	
15	C391-11109	33-249-1	PLATE, worm wheel movement stop	pes	2	1	97	
16	C391-11110	33-249-4	WORM, elevation angle mechanism	pcs	1	95	96	
17	C391-11111	33-250-3	KNOB, elevation angle mechanism, knurled	pcs	1	58	96	
18	C391-11112	33-244-3	SCREW M 3,5, elevation angle mechanism scale nicked, mat length 7,4 mm	pcs	2	1	99	X
19	C391-11113	33-250-4	SCREW M 3,5, knurled knob, length 12 mm	pcs	3	1	96	
20	C391-11114	33-249-2	SCREW M 2,6 worm wheel movement stop plate, length 8 mm	pcs	2	1	97	X
21	C391-11115	33-245-3	SCREW M 2,6 worm external bearing fastening, length 5 mm	pcs	2	0,5	96	X
22	C391-11200	33-248-9	PRESSER, ELEVATION ANGLE MECHANISM WORM	set	1	-	-	
23	C391-11201	33-249-6	PLUG, elevation angle mechanism worm presser	pcs	1	5	98	
24	C391-11202	33-249-7	SPRING, elevation angle mechanism worm presser, \varnothing 5,5 x 13 mm, \varnothing of wire 1 mm	pcs	1	1	98	
25	C391-11203	33-249-8	SCREW M 12,5 x 1, worm presser spring, length 4,5 mm	pes	1	3	98	
26	C391-11115	33-245-3	SCREW M 2,6 worm presser spring screw fastening, length 5 mm	pes	1	0,5	98	X
27	C391-11300	-	INDEX, ELEVATION MECHANISM MICROMETER	set	1	-	-	
28	C391-11301	33-250-7	SLIDER, micrometer index	pcs	1	40	99	
29	C391-11302	-	INDEX, micrometer consisting of: 1 - INDEX, plate 1 - TOOTH, index	set	1	11,4	99	
30	C391-11303	33-250-5 33-250-6 33-250-8	SCREW M 3, micrometer index slider, length 7,7 mm	pcs	4	0,5	99	

Item No.	Nomenclature Number	Producer's Internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No.	Note
3D	C391-11305	3	4	5	6	7	8	9
31	C391-11400	33-250-9	BRAKE, ELEVATION MECHANISM WORM	set	1	-	-	
32	C391-11401	33-251-0	BRAKE, body	pcs	1	18	98	
33	C391-11402	33-251-4	WASHER, worm brake	pcs	1	1	98	
34	C391-11403	33-244-1	SCREW M 5, brake, length 16,5 mm	pcs	1	5	98	
35	C391-11404	33-250-9 33-251-2	SCREW, wing, consisting of: 1 - PLATE 1 - RIVET ϕ 2 x 14 mm 1 - SCREW M 5 length 47 mm	set	1	21,3	98	
36	C391-11501	33-251-3						
37	C391-11502	33-251-1						
38	C391-12000	33-244-5	12000 - ANGLE OF SITE MECHANISM					
39	C391-12100	33-244-5	ANGLE OF SITE MECHANISM	set	1	-	-	
40	C391-12101	33-245-8	MECHANISM, ANGLE OF SITE	set	1	-	-	
41	C391-12102	33-245-9	PIN, angle of site micrometer bracket, taper, ϕ 1,5 x 10 mm	pcs	1	0,5	100	
42	C391-12103	33-244-2	PIN, micrometer bracket and worm sector, ϕ 1,5 x 6 mm	pcs	4	0,25	100	
43	C391-12104	33-245-0	SCALE, angle of site mechanism	pcs	1	3	99	
44	C391-12105	33-245-2	BEARING, angle of site mechanism worm, internal	pcs	1	2	100	
45	C391-12106	33-245-2	BEARING, angle of site mechanism worm, external	pcs	1	3	99	
46	C391-12107	33-246-3	GREASE CUP, consisting of: 1 - BALL ϕ 4,5 mm 1 - GREASE CUP, body 1 - SPRING, taper, ϕ of wire 0,5 mm, length 9 mm	set	1	4,4	102	

44	C391-12107	33-246-2	NUT M 9 x 1, angle of site micrometer bracket, width 6,5 mm	pcs	1	6	100	
45	C391-12108	33-245-7	BRACKET, angle of site micrometer	pcs	1	6	100	
46	C391-12109	33-246-0	MICROMETER, angle of site mechanism	pcs	1	3	100	
47	C391-12110	33-245-1	WORM, angle of site mechanism	pcs	1	15	100	
48	C391-12111	33-244-7	SECTOR, angle of site mechanism worm	pcs	1	15	101	
49	C391-12112	33-246-1	KNOB, angle of site mechanism, knurled	pcs	1	16	100	
50	C391-11112	33-244-3	SCREW M 3,5, angle of site mechanism scale, nicked, mat, length 7,4 mm	pcs	2	1	99	X
51	C391-12113	33-244-8	SCREW M 3,5, worm sector, browned, length 7,4 mm	pcs	2	1	101	
52	C391-11115	33-245-3	SCREW M 2,6, angle of site mechanism worm external and internal bearing fastening, length 5 mm	pcs	2	0,5	100	X
53	C391-12200	33-244-5	PRESSER, ANGLE OF SITE MECHANISM WORM	set	1	-	-	
54	C391-12201	33-245-1	PLUG, angle of site mechanism worm presser	pcs	1	2	100	
55	C391-12202	33-245-5	SPRING, angle of site mechanism worm presser, ϕ m 4 x 12 mm, ϕ of wire 1 mm	pcs	1	0,5	100	
56	C391-12203	33-245-6	SCREW M 8,5 x 1, presser spring, length 4 mm	pcs	1	2	100	
57	C391-11115	33-245-3	SCREW M 2,6 presser spring screw fastening, length 5 mm	pcs	1	0,5	-	X
58	C391-12300	33-246-7	LEVEL, ANGLE OF SITE MECHANISM	set	1	-	-	
59	C391-12301	33-246-8 33-246-9	LEVEL, with support, consisting of: 1 - SUPPORT, level 1 - LEVEL ϕ 8,5 x 42 mm tube	set	1	26	103	
60	C391-12302	33-244-6	BRACKET, level	pcs	1	154	101	
61	C391-12303	33-247-0	GUARD, level	pcs	1	5	103	

1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9
62	C391-12304	33-247-1	SCREW M 14,5 x 1, level bracket, length 11 mm	pcs	1	14	103	
63	C391-13000	33-247-2	13000 - CROSS LEVELING MECHANISM					
64	C391-13100	33-247-2	CROSS LEVELING MECHANISM	set	1	-	-	
65	C391-13101	33-248-8	MECHANISM, CROSS LEVELING INFLUENCE RANGE QUADRANT BRACKET	set	1	-	-	
66	C391-13102	33-247-9	PIN, knurled knob, ϕ 1,5 x 14 mm, taper	pcs	1	1	104	
67	C391-13103	33-248-1	BEARING, worm, internal	pcs	1	7	104	
68	C391-13104	33-247-3	BEARING, worm, external	pcs	1	10	104	
69	C391-13105	33-247-7	BRACKET, range quadrant	pcs	1	840	97	
70	C391-13106	34-167-5	SHAFT, range quadrant bracket	pcs	1	66	97	
71	C391-13107	33-248-0	PLATE, worm sector stop	pcs	2	2	97	
72	C391-13108	33-247-4	WORM, weapon inclination influence eliminating mechanism	pcs	1	42	104	
73	C391-13109	33-248-7	SECTOR, cross leveling mechanism worm	pcs	1	75	97	
74	C391-13110	33-248-2	KNOB, worm, knurled	pcs	1	69	104	
75	C391-13111	33-247-8	SCREW M 2, worm bearing fastening, length 2,5 mm	pcs	1	0,2	104	
76	C391-13112	33-247-5	SCREW M 3, range quadrant bracket shaft fastening, length 4 mm	pcs	1	0,2	97	
			SCREW M 3,5 worm sector, length 12,6 mm	pcs	2	1	97	

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77	C391-11114	33-249-2	SCREW M 2,6, worm sector stop plate, length 8 mm	pcs	2	1	97	X
78	C391-13200	33-247-2	PRESSER, CROSS LEVELING MECHANISM WORM	set	1	-	-	
79	C391-13201	33-248-3	PLUG, worm presser	pcs	1	2	104	
80	C391-13202	33-248-4	SPRING, worm presser, ϕ m 6 x 8,5 mm, ϕ of wire 1 mm	pcs	1	0,5	104	
81	C391-13203	33-248-5	SCREW M 10,5 x 1, worm presser, length 4 mm	pcs	1	2	104	
82	C391-13204	33-248-6	SCREW M 2, spring screw fastening, length 5 mm	pcs	1	0,2	97	
83	C391-13300	33-252-6	CROSS LEVEL	set	1	-	-	
84	C391-13301	33-252-7	LEVEL, with support, consisting of:	pcs	1	8	105	
		33-252-8	1 - SUPPORT, level					
			1 - LEVEL ϕ 7 x 20 mm, tube					
85	C391-13302	33-252-9	GUARD, level	pcs	1	2	105	
86	C391-13303	33-253-0	SCREW M 11 x 1, level support, length 8,5 mm	pcs	1	4	105	
87	C391-14000	33-243-8	14000 - PANORAMIC TELESCOPE FASTENER					
88	C391-14001	33-252-0	FASTENER, PANORAMIC TELESCOPE	set	1	-	-	
89	C391-14002	33-251-7	PIN, panoramic telescope fastener shaft, taper, ϕ 2 x 16 mm	pcs	1	1	106	
90	C391-14003	33-251-6	SPRING, fastener, ϕ m 10 x 18 mm, ϕ of wire 1 mm, torsion	pcs	1	1	106	
91	C391-14004	33-252-3	SHAFT, panoramic telescope fastener	pcs	1	28	106	
		33-252-5	HANDLE /wing nut/, panoramic telescope fastener, consisting of:	set	1	22	106	
		33-252-4	1 - WING, handle					
			1 - HANDLE, body					

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Item No	Nomenclature number	Producer's internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No	Note
1	2	3	4	5	6	7	8	9
92	C391-14005	33-251-8	ADJUSTER, spring fastener	pcs	1	9	106	
93	C391-14006	33-251-9	SCREW M 3, adjuster stop, length 5 mm	pcs	1	0,3	106	
94	C391-14007	33-252-1	SCREW M 5 x 0,5, panoramic telescope fastener, length 10 mm	pcs	2	1,5	102	
95	C391-14008	33-252-2	SCREW M 3, fastener screw fastening, length 6 mm	pcs	2	1	102	
96	C391-31000	-	ACCESSORIES SCREWDRIVER, for sighting device, combined	pcs	1	-	-	Sighting device case

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A. REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS

This register serves for determination of the quantity of built-in parts in the technical mean as a unit for the cases when a same part is in more assemblies respectively subassemblies. The parts which are not entered in the register are in the technical mean in the quantities which are shown in the assembly respectively in the subassembly of the respective part.

Nomenclature number	Denomination	Unit	Quantity per measurement	Item number of the nomenclature	Note
1	2	3	4	5	6
C391-11112	SCREW M 3,5 x 7,4 mm	pcs	4	18, 50	
C391-11114	SCREW M 2,6 x 8 mm	pcs	4	20, 77	
C391-11115	SCREW M 2,6 x 5 mm	pcs	6	21, 26, 52, 57	

B. REGISTER OF THE PRODUCER'S INTERNAL REFERENCES

This register serves for quick identification of parts when only the producer's internal reference is known. The numbers of the internal references of all technical means are listed in a chronological order starting from the smallest toward the largest number.

Producer's internal reference	Item number in the nomenclature	Note	Producer's internal reference	Item number in the nomenclature	Note
1	2	3	1	2	3
33-243-8	87		33-246-0	46	
33-243-9	3		33-246-1	49	
33-244-0	4		33-246-2	44	
33-244-1	34		33-246-3	43	
33-244-2	40		33-246-4	43	
33-244-3	18, 50		33-246-5,6	43	
33-244-4	8		33-246-7	58	
33-244-5	36, 37, 53		33-246-8	59	
33-244-6	60		33-246-9	59	
33-244-7	48		33-247-0	61	
33-244-8	51		33-247-1	62	
33-244-9	2		33-247-2	63, 64, 78	
33-245-0	41		33-247-3	68	
33-245-1	47		33-247-4	72	
33-245-2	42		33-247-5	76	
33-245-3	21, 26, 52, 57		33-247-7	69	
33-245-4	54		33-247-8	75	
33-245-5	55		33-247-9	66	
33-245-6	56		33-248-0	71	
33-245-7	45		33-248-1	67	
33-245-8	38		33-248-2	74	
33-245-9	39		33-248-3	79	

Producer's internal reference	Item number in the nomenclature	Note	Producer's internal reference	Item number in the nomenclature	Note
1	2	3	1	2	3
33-248-4	80		33-250-8	30	
33-248-5	81		33-250-9	31, 35	
33-248-6	82		33-251-0	32	
33-248-7	73		33-251-1	35	
33-248-8	65		33-251-2	35	
33-248-9	5, 6, 22		33-251-3	35	
33-249-0	9		33-249-6	23	
33-249-1	15		33-251-4	33	
33-249-2	20, 77		33-251-6	90	
33-249-3	10		33-251-7	89	
33-249-4	16		33-251-8	92	
33-249-5	11		33-251-9	93	
33-249-6	23		33-252-0	88	
33-249-7	24		33-252-1	94	
33-249-8	25		33-252-2	95	
33-249-9	12		33-252-3	91	
33-250-0	7		33-252-4	91	
33-250-1	13		33-252-5	91	
33-250-2	14		33-252-6	83	
33-250-3	17		33-252-7	84	
33-250-4	19		33-252-8	84	
33-250-5	29		33-252-9	85	
33-250-6	29		33-253-0	86	
33-250-7	28		34-167-5	70	

**5. — NOMENCLATURE OF THE PANORAMIC
TELESCOPE M57 PARTS**

No	Designation number	Producer's internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No	Note
1	2	3	4	5	6	7	8	9
	C388	35-2-1A	PANORAMIC TELESCOPE M 57				107, 108	
			10000 - HEAD, PANORAMIC TELESCOPE					
1	C388-10000	35-2-2B	HEAD, PANORAMIC TELESCOPE	set	1	-	109	
2	C388-10001	35-2-3A	HEAD, body	pcs	1	209	112	
3	C388-10002	35-4-8	COVER, panoramic telescope head, left	pcs	1	26	110	
4	C388-10003	36-295-7	GLASS, head, protective	pcs	1	4	110, 123	
5	C388-10004	36-295-8	GUARD, glass	pcs	1	16	110	
6	C388-10005	36-295-5	SCREW M 3, panoramic telescope head worm wheel stop, length 8 mm	pcs	1	0,4	110	
7	C388-10006	DIN 553	SCREW M 1,7 x 2, head cover fastening	pcs	1	0,1	110	X
8	C388-10007	DIN 87	SCREW M 2 x 6, glass guard	pcs	6	0,2	110	X
9	C388-10100	35-2-2B	MECHANISM, ELEVATION, WITH RECTANGLE PRISM SEAT	set	1	-	111, 112	
10	C388-10101	DIN 7	PIN \emptyset 1 x 4, rectangle prism seat	pcs	2	1	112	
11	C388-10102	DIN 1	PIN \emptyset 2 x 12, elevation micrometer worm, taper	pcs	1	0,4	111	
12	C388-10103	36-295-4	WORM WHEEL, elevation mechanism	pcs	1	49	112	
13	C388-10104	35-4-1	SEAT, rectangle prism	pcs	2	9	112	
14	C388-10105	35-3-0	BEARING, elevation micrometer worm, external	pcs	1	4	111	

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15	C388-10106	35-2-9	BEARING, elevation micrometer worm, internal	pcs	1	2	111	
16	C388-10107	35-3-5	BRACKET, elevation micrometer scale	pcs	1	3	111	
17	C388-10108	-	SPRING, rectangle prism presser, consisting of:	set	1	4,5	112	
		35-4-6	1 - SPRING, leaf					
		35-4-5	2 - GUIDE, spring					
18	C388-10109	35-3-6	SCALE, elevation micrometer	pcs	1	6	111	
19	C388-10110	35-4-2	WASHER, rectangle prism, cork or cardboard	pcs	2	0,25	112	
20	C388-10111	35-4-0	INDEX, elevation mechanism scale	pcs	1	1	112	
21	C388-10112	35-3-4	INDEX, elevation micrometer scale	pcs	1	6	111	
22	C388-10113	35-4-7	COVER, elevation mechanism worm wheel	pcs	1	12	112	
23	C388-10114	35-4-4	PRESSER, rectangle prism	pcs	1	6	112	
24	C388-10115	36-295-6	PRISM, rectangle	pcs	1	17,5	112, 123	
25	C388-10116	35-2-8A	WORM, elevation micrometer	pcs	1	16	111	
26	C388-10117	35-3-7	KNOB, elevation micrometer, knurled	pcs	1	14	111	
27	C388-10119	35-2-5	JOINTING, panoramic telescope head, felt	pcs	1	0,6	112	
28	C388-10120	DIN 84	SCREW M 2 x 5, elevation micrometer scale brake	pcs	3	0,2	111	
29	C388-10007	DIN 87	SCREW M 2 x 6, elevation micrometer scale index	pcs	2	0,2	111	X
30	C388-10121	DIN 63	SCREW M 2 x 5, elevation mechanism worm wheel	pcs	4	0,2	112	
31	C388-10122	DIN 84	SCREW M 1,7 x 2, elevation mechanism scale fastening	pcs	2	0,1	112	
32	C388-10123	DIN 553	SCREW M 1,7 x 3, worm wheel cover fastening	pcs	1	0,1	112	X

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Item No.	Manufacturer's designation	Producer's internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No.	Note
1	2	3	4	5	6	7	8	9
30	C388-10131	DIN 53	SCREW M 1,7 x 2, elevation micrometer worm external bearing fastening	pcs	1	0,1	111	X
33	C388-10006	DIN 553	PRESSER, ELEVATION MECHANISM WORM	set	1	-	-	
34	C388-10200	35-2-2B	PLUG, elevation micrometer worm presser	pcs	1	2	111	
35	C388-10201	35-3-1	SPRING, elevation micrometer worm presser, ϕ m 4,8 x 8,5, ϕ of wire 1 mm	pcs	1	0,5	111	
36	C388-10202	35-3-2	SCREW M 10 x 0,5, worm presser spring, length 4 mm	pcs	1	2	111	
37	C388-10203	35-3-3	SCREW M 1,7 x 2, presser spring screw fastening	pcs	1	0,1	111	X
38	C388-10300	36-296-0	OPEN SIGHT	set	1	-	-	
39	C388-10301	36-296-2	SIGHT	pcs	1	8,5	112	
40	C388-10302	36-296-1	WASHER, sight	pcs	1	9	112	
41	C388-10303	35-5-6	COVER, panoramic telescope head, right	pcs	1	30	112	
42	C388-10120	DIN 84	SCREW M 2 x 5, sight	pcs	2	0,2	112	X
43	C388-10304	DIN 87	SCREW M 2 x 5, sight washer	pcs	2	0,2	112	
44	C388-11000	35-6-2A	11000 - BODY, PANORAMIC TELESCOPE	set	1	-	109	
45	C388-11100	35-6-2A	BODY, PANORAMIC TELESCOPE	set	1	-	109	
46	C388-11101	35-6-3	CASE, panoramic telescope body, lower	pcs	1	156	116, 117, 119	

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48	C388-11102	35-7-6A	CASE, panoramic telescope body, upper	pcs	1	183	116	
49	C388-11103	DIN 7	PIN ϕ 2 x 8, panoramic telescope cover	pcs	2	0,2	116	
50	C388-11104	35-7-7	COVER, panoramic telescope, with fastening tooth	pcs	1	62	116	
51	C388-11105	35-10-6	COVER, panoramic telescope body, lower case	pcs	1	30	116, 119	
52	C388-11106	35-10-7	SCREW M 3, panoramic body lower case cover fastening, length 6 mm	pcs	2	0,3	116	
53	C388-11107	DIN 63	SCREW M 2,6 x 8, panoramic telescope cover fastening	pcs	6	0,5	116	
54	C388-11107	DIN 84	SCREW M 2,6 x 3, roof prism adjusting screw protective	pcs	2	0,1	116	
55	C388-11200	36-297-5	WORM, AZIMUTH MECHANISM, WITH PRESSER	set	1	-	115	
56	C388-11201	DIN 1	PIN ϕ 1,5 x 10, azimuth mechanism worm, taper	pcs	1	0,1	115	X
57	C388-11202	36-299-5	PLUG, azimuth mechanism worm presser	pcs	1	4	115	
58	C388-11203	36-298-1	SLIDER, azimuth mechanism worm disengaging lock	pcs	1	16	115	
59	C388-11204	36-297-8	BEARING, azimuth mechanism worm, external	pcs	1	4	115	
60	C388-11205	36-297-6	BEARING, azimuth mechanism worm, internal	pcs	1	2	115	
61	C388-11206	36-298-2	SPRING, azimuth mechanism worm disengaging slider, leaf, ϕ 20 mm, thickness 0,3 mm	pcs	1	1	115	
62	C388-11207	36-297-9	SPRING, azimuth mechanism worm presser, ϕ m 5,8 x 24 mm, ϕ of wire 1 mm	pcs	1	0,5	115	
63	C388-11208	36-297-7	WORM, azimuth mechanism	pcs	1	23	115	
64	C388-11209	36-298-3	KNOB, azimuth mechanism, knurled	pcs	1	16	115	
65	C388-11210	36-298-0	SCREW M 10 x 0,5, azimuth mechanism worm presser spring, length 4,7 mm	pcs	1	2	115	

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	Manufacturer's Internal reference	Producer's Internal reference	Denomination	Unit	Quantity of parts per as- sembly	Weight per unit in gr.	Fig. No	Note
1	2	3	4	5	6	7	8	9
66	C388-11201 C388-11211	DIN 553	SCREW M 2 x 2, azimuth mechanism worm external bearing fastening	pcs	1	0,1	115	X
67	C388-11212	DIN 553	SCREW M 2 x 2,5, azimuth mechanism worm internal bearing fastening	pcs	1	0,2	115	
68	C388-11300	36-297-5	AZIMUTH MICROMETER WITH MECHANISM FOR INDIVIDUAL CORRECTION	set	1	-	114	
69	C388-11201	DIN 1	PIN Ø 1,5 x 10, azimuth micrometer bracket, taper	pcs	1	0,1	114	X
70	C388-11301	36-299-3	NUT M 10 x 0,75, azimuth micrometer fastening	pcs	1	10	114	
71	C388-11302	36-298-9	BRACKET, azimuth micrometer, with thread M 10 x 0,75 mm	pcs	1	17	114	
72	C388-11303	36-299-1	BRACKET, azimuth micrometer basic position index ring	pcs	1	2	114	
73	C388-11304	36-298-4	SCALE, individual correction	pcs	1	15	114	
74	C388-11305	36-299-0	SCALE, azimuth micrometer	pcs	1	5	114	
75	C388-11306	36-299-2	RING, with azimuth micrometer basic position index	pcs	1	4	114	
76	C388-11307	36-298-6	RING, with azimuth micrometer scale index and individual correction scale index, consisting of:	set	1	12	114	
		36-298-8	1 - SPRING, leaf type					
		36-298-7	1 - RING					
		DIN 660	2 - RIVETS Ø 1,4 x 3,5					
77	C388-11308	36-299-4	RING, Seger	pcs	1	0,2	114	

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78	C388-11309	36-298-5	CROWN, individual correction scale, dented	pcs	1	5	114	
79	C388-11310	DIN 84	SCREW M 2 x 3, individual correction scale dented crown	pcs	2	0,2	114	
80	C388-10120	DIN 84	SCREW M 2 x 5, azimuth micrometer basic position index ring bracket	pcs	2	0,2	114	X
81	C388-11311	DIN 553	SCREW M 2 x 5, azimuth micrometer bracket fastening	pcs	1	0,1	114	
82	C388-11400	35-2-2B	AZIMUTH SCALES WITH COVER AND FASTENER	set	1	-	-	
83	C388-11401	36-296-3 36-296-4 36-296-5 36-296-6	CASE, unmoveable scale, consisting of: 1 - CASE, scale 1 - SPRING, leaf type 1 - RIVET, spring Ø 3 x 5	set	1	37	113	
84	C388-11402	DIN 7	PIN Ø 1,5 x 12, moveable scale cover and knurled knob fastening	pcs	2	0,2	113	
85	C388-11403	36-295-9	SCALE, azimuth, unmoveable	pcs	1	39	113	
86	C388-11404	36-296-9 36-297-0 36-297-2	SCALE, azimuth, moveable, consisting of: 1 - SCALE, azimuth 1 - GUIDE, moveable scale fastening screw	set	1	48	113	
87	C388-11405	36-296-7	COVER, unmoveable scale case, with index	pcs	1	4	113	
88	C388-11406	36-297-3	KNOB, moveable scale fastening, knurled	pcs	1	5	113	
89	C388-11407	36-296-8	SCREW M 3, unmoveable scale case fastening	pcs	4	0,2	113	
90	C388-11408	DIN 87	SCREW M 2,6 x 8, unmoveable scale fastening	pcs	4	0,5	109	
91	C388-11409	36-297-1	SCREW M 4, moveable scale fastening, length 17 mm	pcs	1	1,8	113	
92	C388-11500	35-6-2A	DIFFERENTIAL GEAR	set	1	-	-	
93	C388-11501	35-7-0	HOLDER, dove prism	pcs	1	1	118	

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	Nomenclature number	Producer's internal reference	Denomination	Unit	Quantity of parts per as- sembly	Weight per unit in gr.	Fig. No	Note
1	2	3	4	5	6	7	8	9
94	C388-11502	35-7-3A	WORM WHEEL, azimuth	pcs	1	109	116, 117	
95	C388-11503	35-6-8	SEAT, dove prism	pcs	1	22	118	
96	C388-11504	35-6-5	BRACKET, dove prism	pcs	1	21	118	
97	C388-11505	35-7-1	CASE, dove prism, 27 x 56 x 0,25 mm, paper	pcs	1	0,5	118	
98	C388-11506	35-7-5A	SPRING, wavy	pcs	1	4	116	
99	C388-11507	36-297-4	PRISM, dove	pcs	1	18,5	118, 123	
100	C388-11508	35-7-2	SCREW M 3, dove prism holder, length 5,2 mm	pcs	1	0,3	118	
101	C388-11509	35-6-7	SCREW M 2, bevel gear, length 7 mm	pcs	1	0,3	117	
102	C388-11510	DIN 87	SCREW M 2 x 4, bevel gears	pcs	11	0,1	117	
103	C388-10006	DIN 553	SCREW M 1,7 x 2, dove prism seat fastening	pcs	1	0,1	118	X
104	C388-11511	DIN 553	SCREW M 1,2 x 2, bevel gear screw fastening	pcs	1	0,1	117	
105	C388-11512	35-6-4	GEAR, differencial gear, lower, bevel	pcs	1	14	117	
106	C388-11513	35-7-4	GEAR, differencial gear, upper, bevel	pcs	1	18	117	
107	C388-11514	35-6-6	GEAR, differencial gear, bevel	pcs	1	2	117	
108	C388-11600	35-9-3A	OBJECTIVE WITH SEAT AND BRACKET	set	1	-	119	
109	C388-11601	35-9-4A	BRACKET, objective seat	pcs	1	16	119	

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110	C388-11602	35-10-8	OBJECTIVE, with seat and ring, consisting of:	set	1	9,5	119, 123	
		35-10-9A	1 - SEAT, objective					
		35-11-0	1 - RING, objective seat					
		35-11-2A	1 - LENS, CONCAVE					
		35-11-3A	1 - LENS, CONVEX					
111	C388-10123	DIN 553	SCREW M 1,7 x 3, objective seat fastening	pcs	1	0,1	119	X
112	C388-11603	DIN 553	SCREW M 2 x 3, objective seat bracket fastening	pcs	1	0,2	119	X
113	C388-11700	35-9-3A	PRISM, ROOF, WITH SEAT	set	1	-	119	
114	C388-11701	35-10-5	SEAT, roof prism, two-part	pcs	1	19	119	
115	C388-11702	35-10-4A	PRISM, roof	pcs	1	6	119, 123	
116	C388-11703	DIN 553	SCREW M 2,6 x 5, roof prism adjusting	pcs	2	0,1	119	
12000 - EYEPiece TUBE								
117	C388-12000	35-9-3A	EYEPiece TUBE	set	1	-	109	
118	C388-12100	35-9-3A	EYEPiece TUBE WITH EYEPiece LENS	set	1	-	-	
119	C388-12101	35-9-5A	TUBE, eyepiece	pcs	1	78	121	
120	C388-12102	35-10-3	CASE, eyepiece	pcs	1	11	121	
121	C388-12103	35-9-8	SEAT, eyepiece lens	pcs	1	15	122	
122	C388-12104	35-9-9	INTERMEDIATE RING, eyepiece lens	pcs	1	1	122	
123	C388-12105	35-10-0	RING, eyepiece lens, threaded, M 18,5 x 0,5 mm	pcs	1	1	122	
124	C388-12106	35-11-4A	LENS, eyepiece, consisting of:	set	2	4,5	122, 123	
		35-11-5A	1 - LENS, concave					
		35-11-6A	1 - LENS, convex					
125	C388-11211	DIN 553	SCREW M 2 x 2, eyepiece case fastening	pcs	1	0,1	121	X
126	C388-12107	DIN 88	SCREW M 2 x 4, eyepiece tube fastening	pcs	3	0,5	109	

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Fig. No	Manufacturer's designation	Producer's internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No	Note
		32-11-3V	4	5	6	7	8	9
127	C388-12108	DIN 553	SCREW M 1,4 x 1,4, eyepiece lens ring fastening	pcs	1	0,1	122	X
128	C388-12200	35-9-3A	RETICLE WITH SEAT	set	1	-	-	
129	C388-12201	35-10-2A	RETICLE	pcs	1	0,5	122, 123	
130	C388-12202	35-10-1	SEAT, reticle	pcs	1	8	122	
131	C388-12206	36-29946	RING, reticle, threaded	pcs	1	2	122	
132	C388-11608	DIN 553	SCREW M 2 x 3, reticle seat fastening	pcs	1	0,2	121	X
133	C388-12108	DIN 553	SCREW M 1,4 x 1,4 reticle seat and ring fastening	pcs	2	0,1	122	X
134	C388-12300	35-11-7	WINDOW, RETICLE ILLUMINATING	set	1	-	-	
135	C388-12301	35-11-9	PLATE, reticle illuminating window	pcs	1	0,5	120	
136	C388-12302	35-11-8	GLASS, reticle illuminating window	pcs	1	0,5	120	
137	C388-12303	DIN 63	SCREW M 1,7 x 5, reticle illuminating window plate	pcs	1	0,2	120	
138	C388-12400	35-9-3A	WINDOW, RETICLE ILLUMINATING /ONLY FOR PANORAMIC TELESCOPE WITH CIRCULAR ILLUMINATING WINDOW/	set	1	-	-	
139	C388-12401	38-89-6	RING, reticle illuminating window, external with thread M 8 x 0,5 mm	pcs	1	1	-	
140	C388-12402	38-89-4	RING, reticle illuminating window, internal with thread M 8 x 0,5 mm	pcs	1	1	-	
141	C388-12403	38-89-5	GLASS, reticle, illuminating window	pcs	1	0,2	-	

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142	C388-12108	DIN 553	SCREW M 1,4 x 1,4, reticle illuminating window external ring fastening	pcs	1	0,1	-	X
143	C388-12500	35-12-0	EYE SHIELD	set	1	-	121	
144	C388-12501	35-12-3	NUT M 28 x 0,5 eye shield, width 7 mm	pcs	1	14	120	
145	C388-12502	35-12-1	BRACKET, eye shield, with thread M 28 x 0,5 mm	pcs	1	24	120	
146	C388-12503	35-12-2	SHIELD, eye, soft rubber	pcs	1	12	120	
ACCESSORIES								
147	C388-51000	A114-20205	BRUSH, for optics cleaning, soft, length 140 mm	pcs	1	1	124	Sighting device case/
148	C388-52000	-	LEATHER, chamois 150 x 150 mm	pcs	-	-	124	case for wad
149	C388-53000	-	CLOTH, flannel 150 x 150 mm	pcs	-	-	124	case for wad
150	C388-54000	A114-29253	CASE for wad and chamois-leather /cloth/	pcs	-	-	124	O.K. case
151	C388-55000	-	WAD	gr.	-	-	124	case for wad

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A - REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS

This register serves for determination of the quantity of built-in parts in the technical mean as a unit for the cases when a same part is in more assemblies respectively subassemblies. The parts which are not entered in the register are in the technical mean in the quantities which are shown in the assembly respectively subassembly of the respective part.

Nomenclature number	Denomination	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
C388-10006	SCREW M 1,7 x 2 DIN 553	pcs	4	7, 33, 38, 103	
C388-10007	SCREW M 2 x 6 DIN 87	pcs	8	8, 29	
C388-10120	SCREW M 2 x 5 DIN 84	pcs	7	28, 43, 80	
C388-10123	SCREW M 1,7 x 3 DIN 553	pcs	2	32, 111	
C388-11201	PIN ϕ 1,5 x 10 DIN 1	pcs	2	56, 69	
C388-11211	SCREW M 2 x 2 DIN 553	pcs	2	66, 125	
C388-11603	SCREW M 2 x 3 DIN 553	pcs	2	112, 132	
C388-12108	SCREW M 1,4 x 1,4 DIN 553	pcs	4	127, 133, 142	

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B. REGISTER OF THE PRODUCER'S INTERNAL REFERENCES

This register serves for quick identification of parts when only the producer's internal reference is known. The numbers of the internal references of all technical means are listed in a chronological order starting from the smallest toward the largest number.

Producer's internal reference	Item number in the nomenclature	Note	Producer's internal reference	Item number in the nomenclature	Note
1	2	3	1	2	3
35-2-2B	1, 9, 34, 82		35-6-2A	45, 46, 92	
35-2-3A	2		35-6-3	47	
35-2-5	27		35-6-4	105	
35-2-8A	25		35-6-5	96	
35-2-9	15		35-6-6	107	
35-3-0	14		35-6-7	101	
35-3-1	35		35-6-8	95	
35-3-2	36		35-7-0	93	
35-3-3	37		35-7-1	97	
35-3-4	21		35-7-2	100	
35-3-5	16		35-7-3A	94	
35-3-6	18		35-7-4	106	
35-3-7	26		35-7-5A	98	
35-4-0	20		35-7-6A	48	
35-4-1	13		35-7-7	50	
35-4-2	19		35-9-3A	108, 113, 117, 118, 128, 138	
35-4-4	23		35-9-4A	109	
35-4-5	17		35-9-5A	119	
35-4-6	17		35-9-8	121	
35-4-7	22		35-9-9	122	
35-4-8	3		35-10-0	123	
35-5-6	42				

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
35-10-1	130		36-296-6	83	
35-10-2A	129		36-296-7	87	
35-10-3	120		36-296-8	89	
35-10-4A	115		35-296-9	86	
35-10-5	114		35-297-0	86	
35-10-6	51		36-297-1	91	
35-10-7	52		36-297-2	86	
35-10-8	110		36-297-3	88	
35-10-9A	110		36-297-4	99	
35-11-0	110		36-297-5	55, 68	
35-11-2A	110		36-297-6	60	
35-11-3A	110		36-297-7	63	
35-11-4A	124		36-297-8	59	
35-11-5A	124		36-297-9	62	
35-11-6A	124		36-298-0	65	
35-11-7	134		36-298-1	58	
35-11-8	136		36-298-2	61	
35-11-9	135		36-298-3	64	
35-12-0	143		36-298-4	73	
35-12-1	145		36-298-5	78	
35-12-2	146		36-298-6	76	
35-12-3	144		36-298-7	76	
36-295-4	12		36-298-8	76	
36-295-5	6		36-298-9	71	
36-295-6	24		36-299-0	74	
36-295-7	4		36-299-1	72	
36-295-8	5		36-299-2	75	
36-295-9	85		36-299-3	70	
36-296-0	39		36-299-4	77	
36-296-1	41		36-299-5	57	
36-296-2	40		36-299-6	131	
36-296-3	83		38-89-4	140	
36-296-4	83		38-89-5	141	
36-296-5	83		38-89-6	139	

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Producer's internal reference	Item number in the nomen- clature	Note	Producer's internal reference	Item number in the nomen- clature	Note
1	2	3	1	2	3
DIN 1	11, 56, 69		DIN 553	7, 32, 33, 38, 66, 67, 81, 103, 104, 111, 112, 116, 125, 127, 132, 133, 142	
DIN 7	10, 49, 84				
DIN 63	30, 53, 137				
DIN 84	28, 31, 43, 54, 79, 80				
DIN 87	8, 29, 44, 90, 102		DIN 600	76	
DIN 88	126		A114-29253	150	
			A114-20205	147	

6. NOMENCLATURE OF THE QUADRANT M50 PARTS

36-290-1	40
36-290-2	50
36-290-3	60
36-290-4	70
36-290-5	80

Item No	Designation number	Producer's internal reference	Denomination	Unit	Quantity of parts per as- sembly	Weight per unit in gr.	Fig. No	Note
1	2	3	4	5	6	7	8	9
	C564 C565	- 33-230-8	GUNNER'S QUADRANT M 50/1/6000/ GUNNER'S QUADRANT M 50/1/6400/ 11000 - BODY, GUNNER'S QUADRANT WITH DEVICE FOR PRECISE AND ROUGH MOVEMENT OF THE LEVEL BRACKET				125, 129	
1	C565-11000	33-230-8	BODY, GUNNER'S QUADRANT WITH DEVICE FOR ROUGH AND PRECISE MOVEMENT OF THE LEVEL BRACKET	set	1	-	-	
2	C565-11100	33-230-8	BODY, GUNNER'S QUADRANT WITH DEVICE FOR ROUGH MOVEMENT OF THE LEVEL BRACKET	set	1	-	-	
3	C565-11101	33-231-7	PIN, level bracket shaft, ϕ 1,5 x 5 mm	pcs	1	0,5	127	X
4	C564-11102	-	QUADRANT, body /only for division 1/6000/	pcs		440	-	
5	C565-11102	33-231-0	QUADRANT, body /only for division 1/6400/	pcs	1	440	126	
6	C565-11103	33-231-3	NUT M 6, level bracket shaft, width 5 mm	pcs	1	3,5	126	
7	C565-11104	33-233-6	NUT M 6, bracket lever fastening, width 10 mm	pcs	1	8	126	
8	C564-11105	-	BRACKET, level /only for division 1/6000/	pcs	1	117	-	
9	C565-11105	33-233-9	BRACKET, level /only for division 1/6400/	pcs	1	117	128	
10	C565-11106	33-231-1	SHAFT, level bracket	pcs	1	1	127	

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11	C565-11107	33-231-2	WASHER, level bracket shaft nut	pcs	1	2	126	
12	C565-11108	33-233-3	WASHER, fastening nut	pcs	1	2	126	
13	C565-11109	33-234-8 33-234-6	LEVER, level bracket, consisting of: 1 - SHAFT, with outside thread M 6 x 8 mm and inside thread M 2,6 x 8 mm	set	1	40	127	
		33-234-3	1 - LEVER					
		33-234-7	1 - GUIDE, precise movement screw					
14	C565-11110	33-231-6	SCREW M 3, level bracket shaft, length 12 mm	pcs	1	5	127	
15	C565-11111	33-231-4	SCREW M 3, level bracket shaft screw and nut fastening, length 8,8 mm	pcs	2	2	126, 127	X
16	C565-11112	33-233-7	SCREW M 2,6, level bracket lever, length 8 mm	pcs	1	1,5	126	
17	C565-11200	33-233-4	DEVICE FOR PRECISE MOVEMENT OF THE LEVEL BRACKET	set	1	-	-	
18	C565-11201	33-234-2	PIN, level bracket precise movement device screw, ϕ 1,5 x 5 mm, taper	pcs	1	1	127	
19	C565-11202	33-233-0	SPRING, level bracket, precise movement screw presser, ϕ 1,5 x 11 mm, ϕ 1 wire 1 mm	pcs	1	3	127	X
20	C565-11203	33-234-3	PRESSER, level bracket precise movement screw	pcs	1	1	127	
21	C565-11204	33-234-1	KNUT, level bracket precise movement screw	pcs	1	5	127	
22	C565-11205	33-234-0	SCREW M 5 x 0,5 mm, level bracket precise movement, length 25 mm	pcs	1	6	127	
23	C565-11206	33-234-4	SCREW M 10,5 x 0,75 mm, level bracket precise movement presser screw spring, length 6 mm	pcs	1	3	127	

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Item No	Designation number	Producer's internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No	Note
23	C565-11500	33-233-4	SCREW M 3, level bracket precise movement, screw, movement adjusting, length 8 mm	pcs	1	1	127	
24	C565-11207	33-233-8	SCREW M 3, presser spring screw fastening, length 5,5 mm	pcs	1	2	127	X
25	C565-11500	33-233-4	12000 - MECHANISM FOR PRECISE ANGLE SETTING	set	1	-	-	
26	C565-12000	33-230-9	MECHANISM FOR PRECISE ANGLE SETTING	set	1	-	-	
27	C565-12001	33-232-2	PLUG, level seat presser	pcs	1	1,5	128	
28	C565-11101	33-231-7	PIN, precise angle setting mechanism scale stop, ϕ 1,5 x 5 mm	pcs	1	0,5	128	X
29	C565-12002	33-232-8	SEAT, level consisting of: 1 - SEAT 1 - INSERT	set	1	80	128	
30	C565-12003	33-233-1	LEVEL ϕ 8 x 36 mm, tube	pcs	1	1,5	128	
31	C565-12004	33-232-5	BRACKET, level seat presser spring consisting of: 1 - PLATE 1 - SEAT	set	1	8	128	
32	C565-11202	33-232-3	SPRING, level seat presser, ϕ m 7 x 11 mm, ϕ of wire 1 mm	pcs	1	3	128	X
33	C565-12005	33-233-3	SHAFT, level seat	pcs	1	5	128	
34	C564-12006	-	MICROMETER, precise angle setting mechanism /only for division 1/6000/	pcs	1	12	-	

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35	C565-12006	33-231-9	MICROMETER, precise angle setting mechanism /only for division 1/6400/	pcs	1	12	128	
36	C565-12007	33-232-0	KNOB, precise angle setting mechanism scale, knurled	pcs	1	8	128	
37	C565-12008	33-231-8	SCREW M 10 x 1,25 mm, precise angle setting, length 23 mm	pcs	1	11	128	
38	C565-12009	33-232-1	SCREW M 2, scale knurled knob, with countersunk head, length 8 mm	pcs	3	1	128	
39	C565-12010	33-232-4	SCREW M 2, presser spring bracket, with semi-round head, length 8 mm	pcs	3	1	128	
40	C565-12011	33-233-2	SCREW M 10 x 1 mm, level seat, length 6 mm	pcs	1	2	128	
41	C565-13000	113-29615	13000 - CASE, GUNNER'S QUADRANT CASE, GUNNER'S QUADRANT	set	-	450	129	
42	C565-30000	307-51273	50000 - ACCESSORIES SCREWDRIVER	pcs	-	8	129	

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A. REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS

This register serves for determination of the quantity of built-in parts in the technical mean as a unit for the cases when a same part is in more assemblies respectively subassemblies. The parts which are not entered in the register are in the technical mean in the quantities which are shown in the assembly respectively subassembly of the respective part.

Nomenclature number	Denomination	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
C565-11101	PIN ϕ 1,5 x 5 mm	pcs	2	3, 28	
C565-11111	SCREW M 3 x 5,5 mm	pcs	3	15, 25	
C565-11202	SPRING ϕ out. 7 x 11 mm, ϕ of wire 1 mm	pcs	2	19, 32	

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B. REGISTER OF THE PRODUCER'S INTERNAL REFERENCES

This register serves for quick identification of parts when only the producer's internal reference is known. The numbers of the internal references of all technical means are listed in a chronological order starting from the smallest toward the largest number.

Producer's internal reference	Item number in the nomenclature	Note	Producer's internal reference	Item number in the nomenclature	Note
1	2	3	1	2	3
33-231-8	1, 2		33-232-9	29	
33-231-9	26		33-233-1	30	
33-231-0	5		33-233-2	40	
33-231-1	10		33-233-3	33	
33-231-2	11		33-233-4	17	
33-231-3	6		33-233-5	12	
33-231-4	15, 25		33-233-6	7	
33-231-5	29		33-233-7	16	
33-231-6	14		33-233-8	24	
33-231-7	3, 28		33-233-9	9	
33-231-8	37		33-234-0	22	
33-231-9	35		33-234-1	21	
33-232-0	36		33-234-2	18	
33-232-1	38		33-234-3	20	
33-232-2	27		33-234-4	23	
33-232-3	19, 32		33-234-5	13	
33-232-4	39		33-234-6	13	
33-232-5	31		33-234-7	13	
33-232-6	31		33-234-8	13	
33-232-7	31		307-51273	42	
33-232-8	29		113-29615	41	

7. — NOMENCLATURE OF THE LIGHTING ACCESSORIES PO-2 PARTS

1	1-400-00	1	1-400-00
2	1-400-00	2	1-400-00
3	1-400-00	3	1-400-00
4	1-400-00	4	1-400-00
5	1-400-00	5	1-400-00
6	1-400-00	6	1-400-00
7	1-400-00	7	1-400-00
8	1-400-00	8	1-400-00
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98	1-400-00	98	1-400-00
99	1-400-00	99	1-400-00
100	1-400-00	100	1-400-00

Item No	Nomenclature Number	Producer's internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No	Note
1	2	3	4	5	6	7	8	9
	C627	31-258-1	LIGHTING ACCESSORIES PO-2				130	
			11000 - RETICLE ILLUMINATING LAMP					
1	C627-11000	31-258-2	LAMP, RETICLE ILLUMINATING	set	1	-	130, 131	
2	C627-11100	31-258-2*	HOUSING, RETICLE ILLUMINATING LAMP	set	1	-	131	
3	C627-11101	30-162-2	SOCKET, bulb	pcs	1	4	131	X
4	C627-11102	30-162-0	INSULATOR, lamp housing, right, bakelite	pcs	1	3	131	
5	C627-11103	30-162-1	INSULATOR, lamp housing, left, bakelite	pcs	1	3	131	
6	C627-11104	30-162-4	CONTACT, housing, electrical cable, front	pcs	1	0,4	131	
7	C627-11105	30-163-0	CONTACT, housing electrical cable, rear	pcs	1	0,5	131	X
8	C627-11106	30-162-5	CONTACT, bulb	pcs	1	2	131	X
9	C627-11107	30-161-8	SEAT, bulb socket, with thread M 16 x 1 mm, length of thread 8 mm, hard rubber	pcs	1	3,5	131	
10	C627-11108	30-162-8	NUT M 3, insulator screw and bulb contact, width 2,4 mm	pcs	2	1,5	131	X
11	C627-11109	30-162-3	WASHER, insulation, hard rubber or fiber	pcs	1	0,2	131	X
12	C627-11110	30-163-1	RING, lamp housing insulator	pcs	1	1	131	X
13	B102-46002	-	BULB 2,5 V	pcs	1	2	131	X
14	C627-11111	30-161-9	SCREW M 3, lamp housing insulator, length 17,5 mm	pcs	1	0,75	131	X
15	C627-11200	-	FASTENER, RETICLE ILLUMINATING LAMP	set	1	-		

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16	C627-11201	30-162-7	SPRING, lamp fastener tooth, ϕ of wire 0,5 mm	pcs	1	0,2	131	
17	C627-11202	30-161-7	BODY, lamp fastener, with thread M 16 x 1 mm	pcs	1	15	131	
18	C627-11203	30-162-9	SCREW M 3, lamp fastener tooth, length 8 mm	pcs	1	0,8	131	
19	C627-11204	30-162-6	TOOTH, lamp fastener	pcs	1	2	131	
			12000 - MOVEABLE LAMP					
20	C627-12000	31-258-3	LAMP, MOVEABLE	set	1	-	130, 132	
21	C627-12100	31-258-3	HOUSING, LAMP, WITH SWITCH	set	1	-	132	
22	C627-11101	30-162-2	SOCKET, lamp	pcs	1	4	132	X
23	C627-12101	30-160-5	INSULATOR, housing, right, bakelite	pcs	1	3	132	
24	C627-12102	30-160-6	INSULATOR, housing, left, bakelite	pcs	1	3	132	
25	C627-11104	30-163-0	CONTACT, moveable lamp electrical cable, rear	pcs	1	0,5	132	X
26	C627-11106	30-162-5	CONTACT, bulb	pcs	1	2	132	X
27	C627-12103	30-160-0	CONTACT, switch	pcs	1	0,5	132	
28	C627-12104	30-160-4	SEAT, bulb socket, with thread M 16 x 1 mm, length of thread 8 mm, hard rubber	pcs	1	3,3	132	
29	C627-11108	30-162-8	NUT M 3, insulator screw and bulb contact, width 2,4 mm	pcs	2	1,5	132	X
30	C627-12105	30-160-9	SPRING, switch, ϕ m 2,1 x 9 mm, ϕ of wire 0,4 mm	pcs	1	1	132	
31	C627-11109	30-162-3	WASHER, insulation, hard rubber of fiber	pcs	1	0,2	132	X
32	C627-12106	31-258-3 30-161-4 30-161-2 30-161-5	FASTENER, moveable lamp, consisting of: 1 - SPRING 1 - BODY 2 - RIVETS	set	1	19,5	132	

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Item No.	Manufacturer's designation	Manufacturer's internal reference	Denomination	Unit	Quantity of parts per assembly	Weight per unit in gr.	Fig. No.	Note
1	2	3	4	5	6	7	8	9
33	C627-12107	30-160-8	SWITCH, consisting of: 1 - BUTTON, switch	set	1	1	132	
34	C627-11110	30-160-7	1 - PLATE, contact	pcs	1	1	132	X
35	C627-11110	30-163-1	RING, housing insulator	pcs	1	2	132	X
36	C627-11111	30-161-9	BULB, 2,5 V	pcs	1	0,75	132	X
37	C627-12200	31-258-3	SCREW M 3, housing insulator, length 17,5 mm	set	1	-	-	
38	C627-12201	30-207-0	FILTER WITH BRACKET	pcs	1	2	132	
39	C627-12202	30-161-2	FILTER	pcs	1	12	132	
40	C627-12203	30-206-9	BRACKET, filter, with thread M 16 x 1 mm	pcs	1	0,5	132	
41	C627-13000	-	RING, filter bracket, spring	set	1	-	-	
42	C627-13001	-	13000 - CABLE WITH PLUG	set	1	-	-	
43	C627-13002	-	CABLE WITH PLUG	pcs	1	46	130, 133	
44	C627-13003	-	CABLE, moveable lamp, 2 x 0,75 mm 2 GG, length 900 mm	pcs	1	51	130, 133	
45	C627-13004	-	CABLE, reticle illuminating lamp, 2 x 0,75 mm 2 GG, length 1000 mm	pcs	1	15	130, 133	
			PLUG, two pin, simple	pcs	1	6	130, 133	
			PROTECTOR, cable branch, rubber, ϕ 14/9 x 50 mm	pcs	1	6	130, 133	

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46	C627-14000	A114-29631	14000 - CASE WITH DRY BATTERIES	set	1	200	130	
47	B102-46003	A114-29264	CASE WITH DRY BATTERIES	pcs	2	105	-	
	B102-46003		INSERT - DRY BATTERY					

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A. REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS

This register serves for determination of the quantity of built-in parts in the technical mean as a unit for the cases when a same part is in more assemblies respectively subassemblies. The parts which are not entered in the register are in the technical mean in the quantities which are shown in the assembly respectively subassembly of the respective part.

Nomenclature number	Denomination	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
C627-11101	SOCKET, bulb	pcs	2	3, 22	
C627-11105	CONTACT, electrical cable, rear	pcs	2	7, 25	
C627-11106	CONTACT, bulb	pcs	2	8, 26	
C627-11108	NUT M 3, insulator screw and bulb contact, width 2,4 mm	pcs	4	10, 29	
C627-11109	WASHER, insulation	pcs	2	11, 31	
B102-46002	BULB 2,5 V	pcs	2	13, 35	
C627-11110	RING, insulator	pcs	2	12, 34	
C627-11111	SCREW M 3, housing insulator, length 17,5 mm	pcs	2	14, 36	

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B. REGISTER OF THE PRODUCER'S INTERNAL REFERENCES

This register serves for quick identification of parts when only the producer's internal reference is known. The numbers of the internal references of all technical means are listed in a chronological order starting from the smallest toward the largest number.

Producer's internal reference	Item number in the nomenclature	Note	Producer's internal reference	Item number in the nomenclature	Note
1	2	3	4	5	6
30-160-0	27		30-160-	2	
30-160-1	28		30-160-	1, 3	
30-160-2	29		30-160-		
30-160-3	24		30-160-	2	
30-160-4	30		30-160-	1	
30-160-5	33		30-160-	4	
30-160-6	30		30-160-	1, 2	
30-161-2	35		30-160-	4	
30-161-3	36		30-160-	2	
30-161-4	36		30-160-	3	
30-161-5	32		30-200-	4	
30-161-7	17		30-200-	38	
30-161-8	9		30-200-	1, 2	
30-161-9	14, 36		30-200-	20, 21, 32, 37	
30-162-0	4		30-290-	47	
30-162-1	5		30-290-	46	

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A. REGISTER OF NOMENCLATURE NUMBERS OF SAME PARTS

This register serves for determination of the quantity of built-in parts in the technical mean as a unit for the cases when a same part is in more assemblies respectively subassemblies. The parts which are not entered in the register are in the technical mean in the quantities which are shown in the assembly respectively subassembly of the respective part.

Nomenclature number	Denomination	Unit	Quantity per weapon	Item number of the nomenclature	Note
1	2	3	4	5	6
C627-11101	SOCKET, bulb	pcs	2	3, 22	
C627-11105	CONTACT, electrical cable, rear	pcs	2	7, 25	
C627-11106	CONTACT, bulb	pcs	2	8, 26	
C627-11108	NUT M 3, insulator screw and bulb contact, width 2,4 mm	pcs	4	10, 29	
C627-11109	WASHER, insulation	pcs	2	11, 31	
B102-46002	BULB 2,5 V	pcs	2	13, 35	
C627-11110	HING, insulator	pcs	2	12, 34	
C627-11111	SCREW M 3, housing insulator, length 17,5 mm	pcs	2	14, 36	

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B. REGISTER OF THE PRODUCER'S INTERNAL REFERENCES

This register serves for quick identification of parts when only the producer's internal reference is known. The numbers of the internal references of all technical means are listed in a chronological order starting from the smallest toward the largest number.

Producer's internal reference	Item number in the nomenclature	Note	Producer's internal reference	Item number in the nomenclature	Note
1	2	3	1	2	3
30-160-0	27		30-162-2	3, 22	
30-160-4	28		30-162-3	11, 31	
30-160-5	23		30-162-4	6	
30-160-6	24		30-162-5	8, 26	
30-160-7	33		30-162-6	19	
30-160-8	33		30-162-7	16	
30-160-9	30		30-162-8	10, 29	
30-161-2	39		30-162-9	18	
30-161-3	32		30-163-0	7, 25	
30-161-4	32		30-163-1	12, 34	
30-161-5	32		30-206-9	40	
30-161-7	17		30-207-0	38	
30-161-8	9		31-258-2	1, 2	
30-161-9	14, 36		31-258-3	20, 21, 32, 37	
30-162-0	4		A114-29264	47	
30-162-1	5		A114-29631	46	

Item number	Order of the Ordinance department for the change and number of the command /authority/ document which has introduced the change	Where the change is made			Date and signature of the person which has performed the change
		on which page	which line		
			from above	from below	
1	2	3	4	5	6

Restricted

MOUNTAIN GUN
76 mm M 48 B1, B1A1, B1A2, B1A3 and B1A4
BOOK III and IV
F I G U R E S

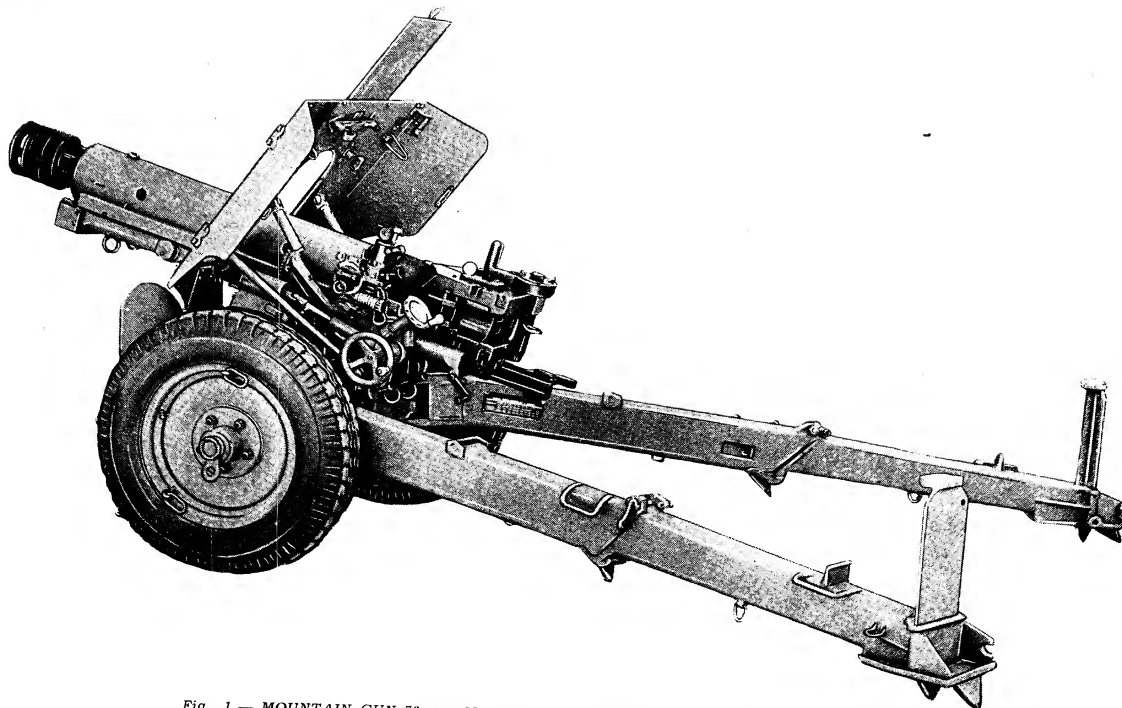


Fig. 1 — MOUNTAIN GUN 76 mm M. 48 B1A1 — View in combat position the left rear side

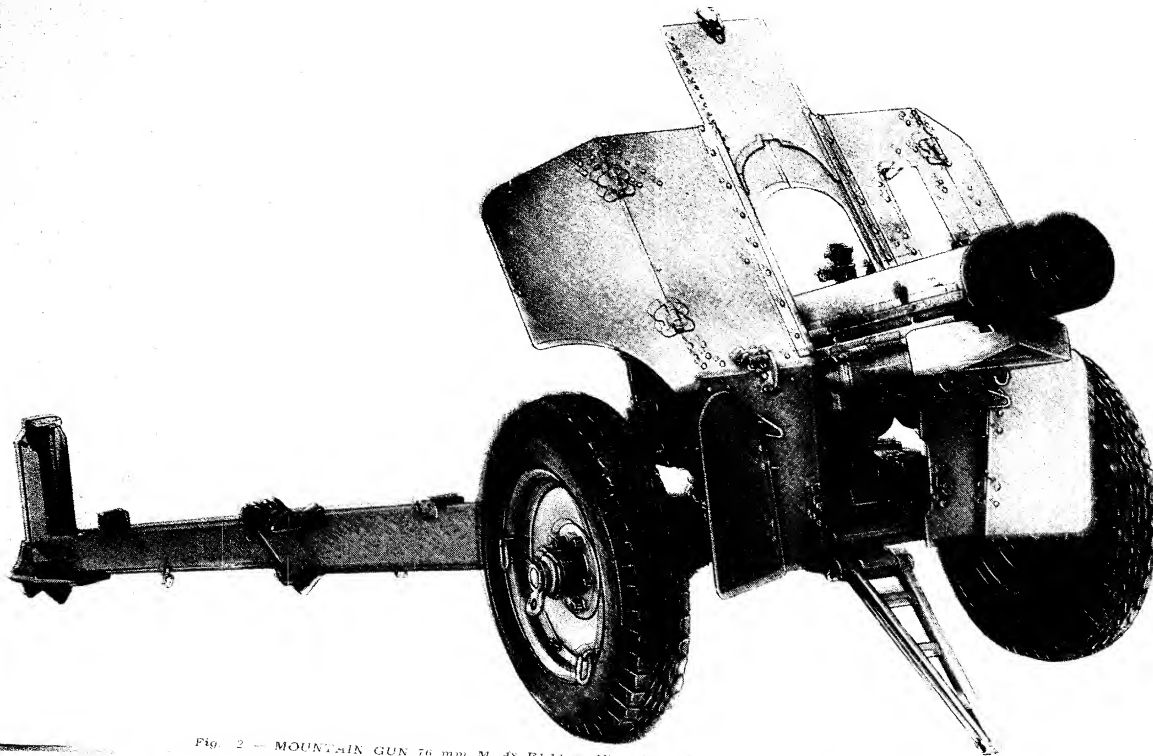


Fig. 2 — MOUNTAIN GUN 76 mm M. 48 B1A1 — View in combat position (the right hand side)

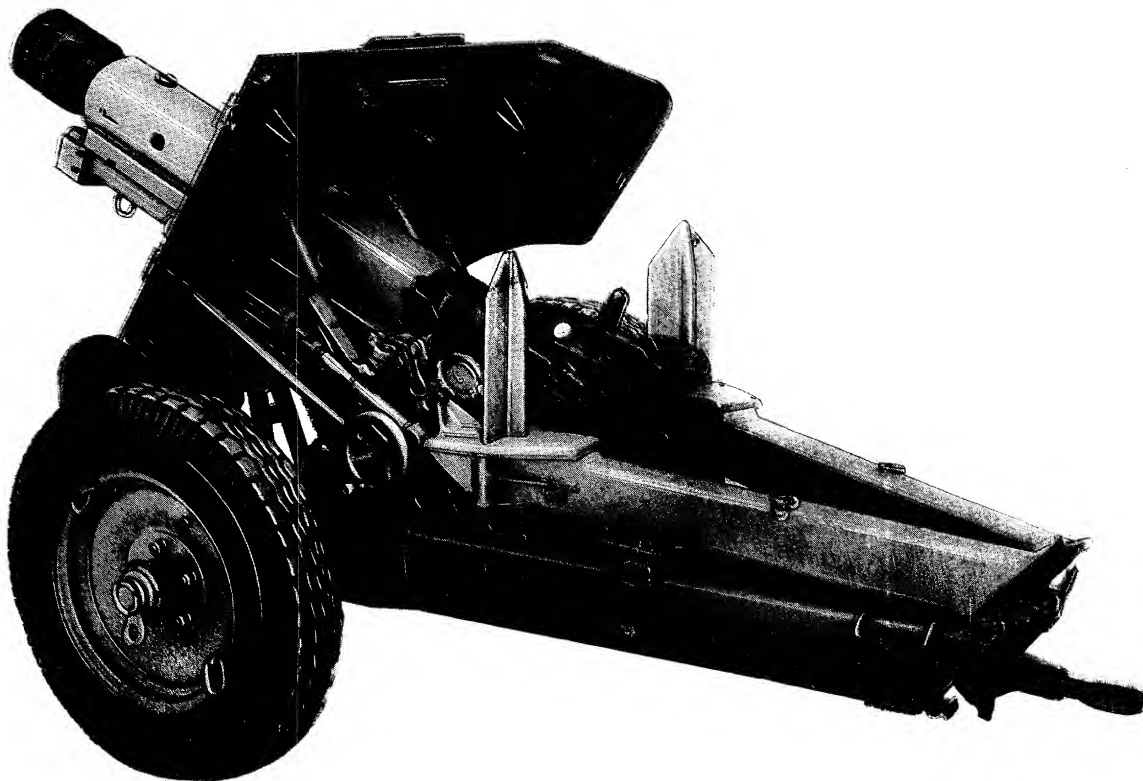


Fig. 3 — MOUNTAIN GUN 76 mm M. 48 B1A1 — View in march position without cover

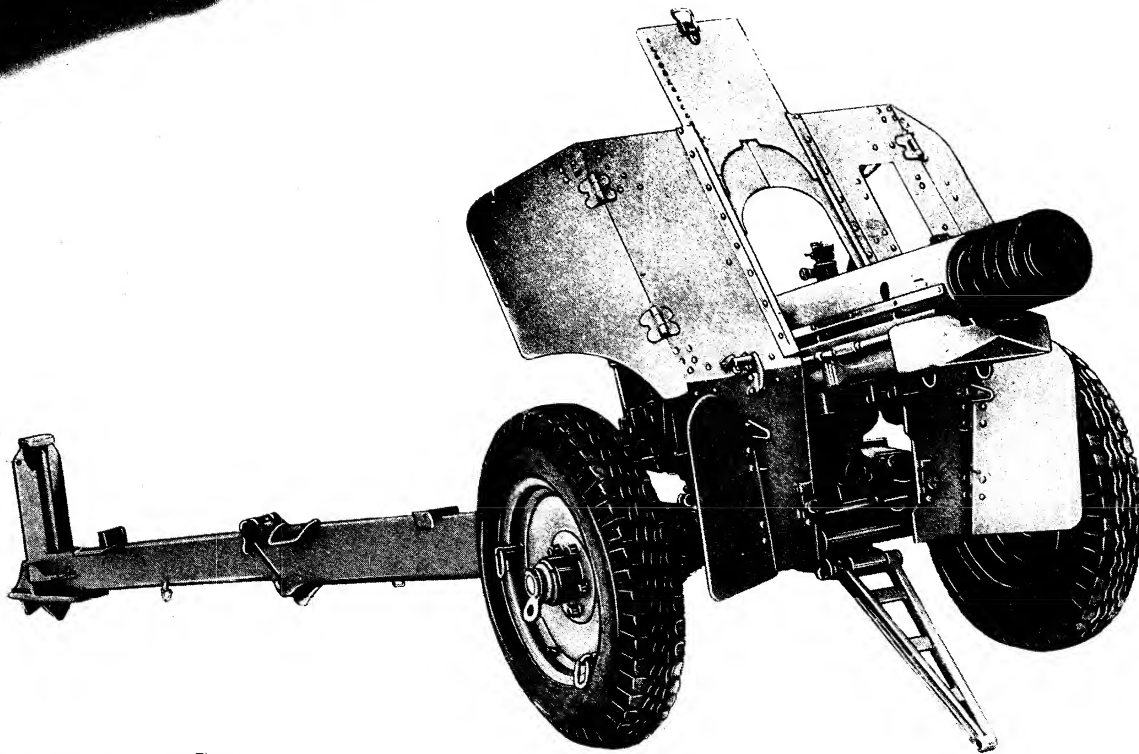


Fig. 2 — MOUNTAIN GUN 76 mm M. 48 B1A1 — View in combat position the right front side

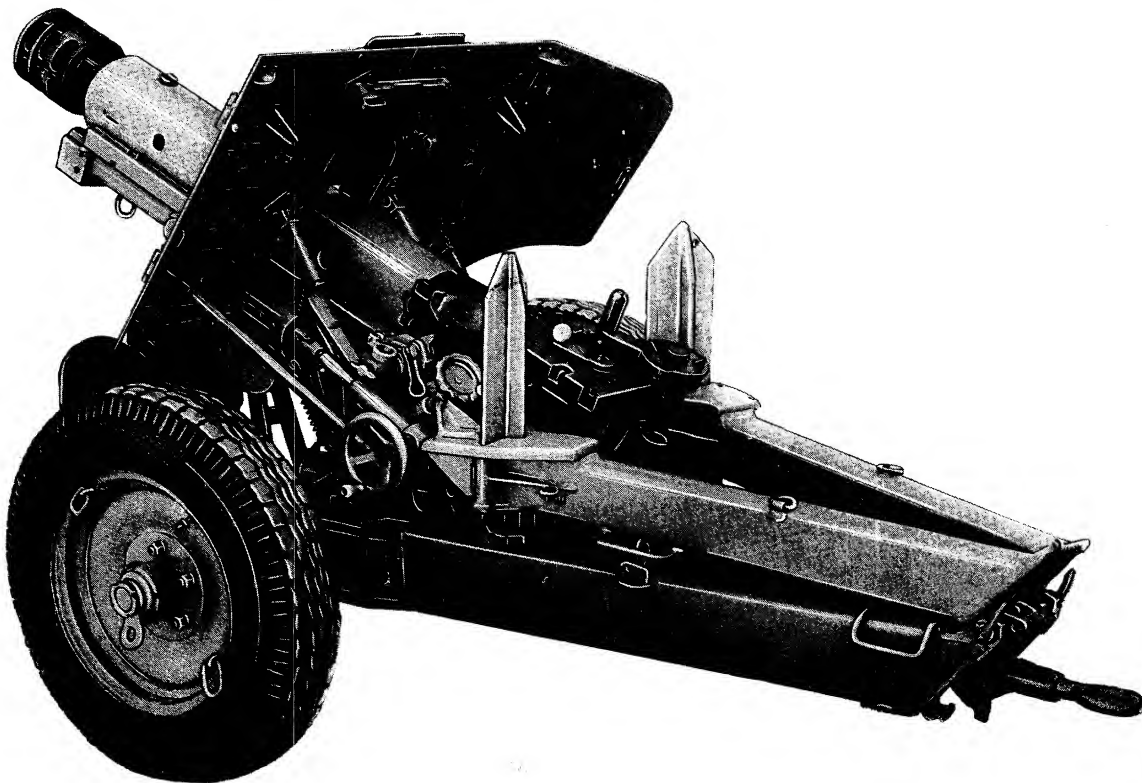


Fig. 3 — MOUNTAIN GUN 76 mm M. 48 B1A1 — View in march position without cover

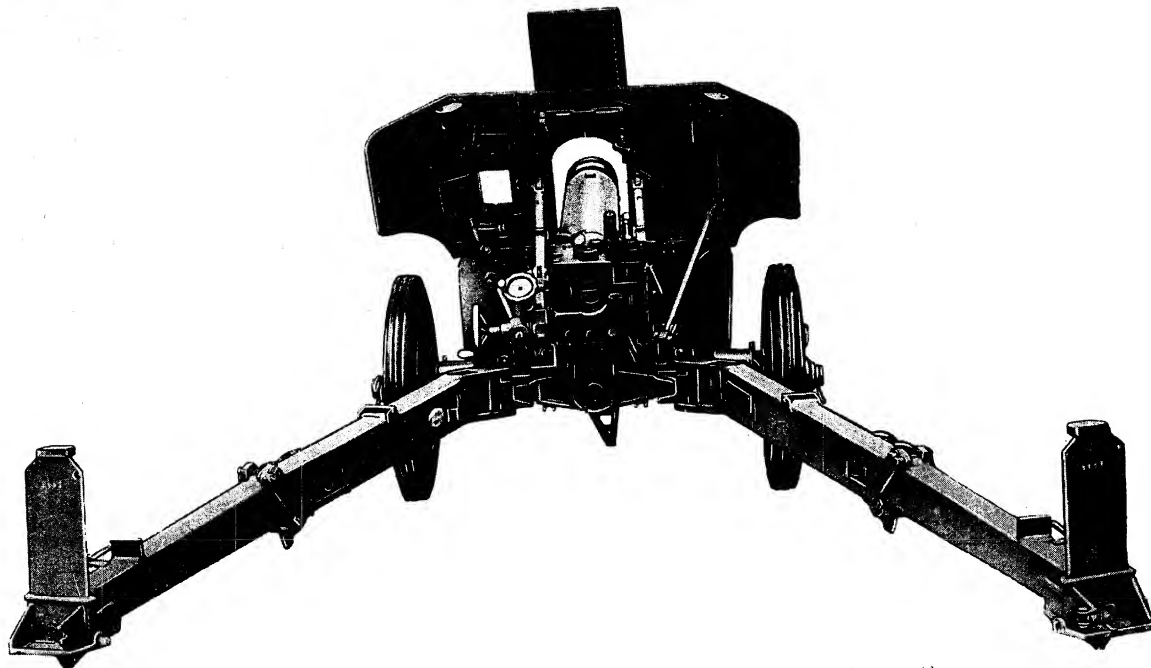


Fig. 4 — MOUNTAIN GUN 76 mm M. 48 B1A2 — View in combat position from the rear side

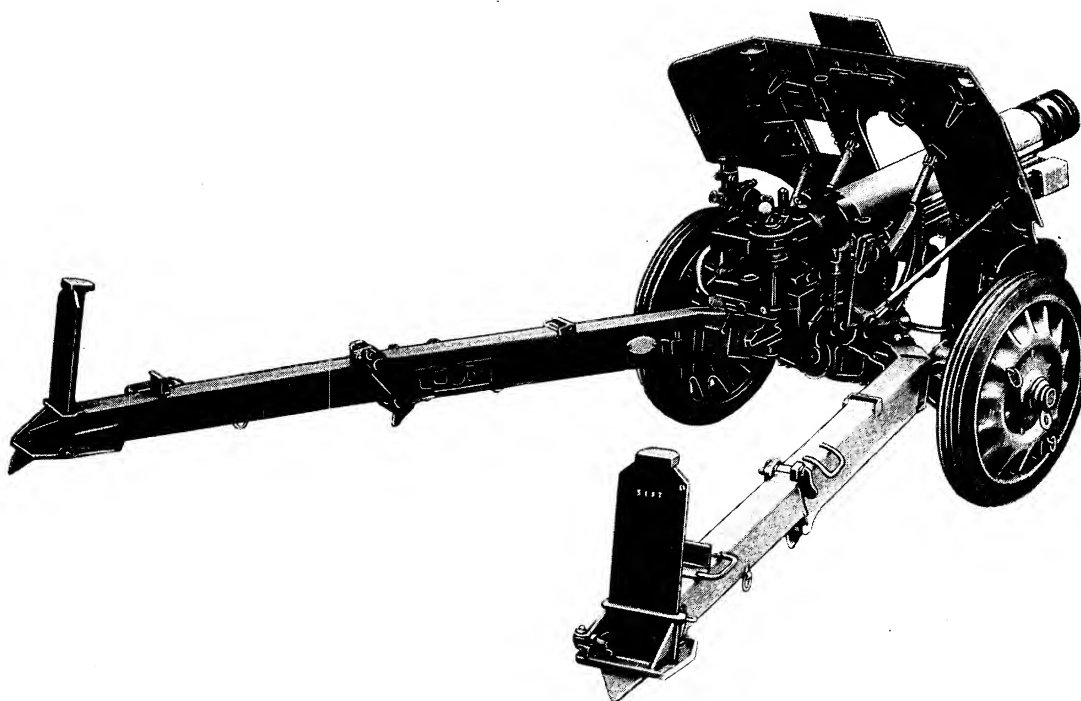


Fig. 5 — MOUNTAIN GUN 76 mm M. 48 B1A2 — View in combat position from the right rear side

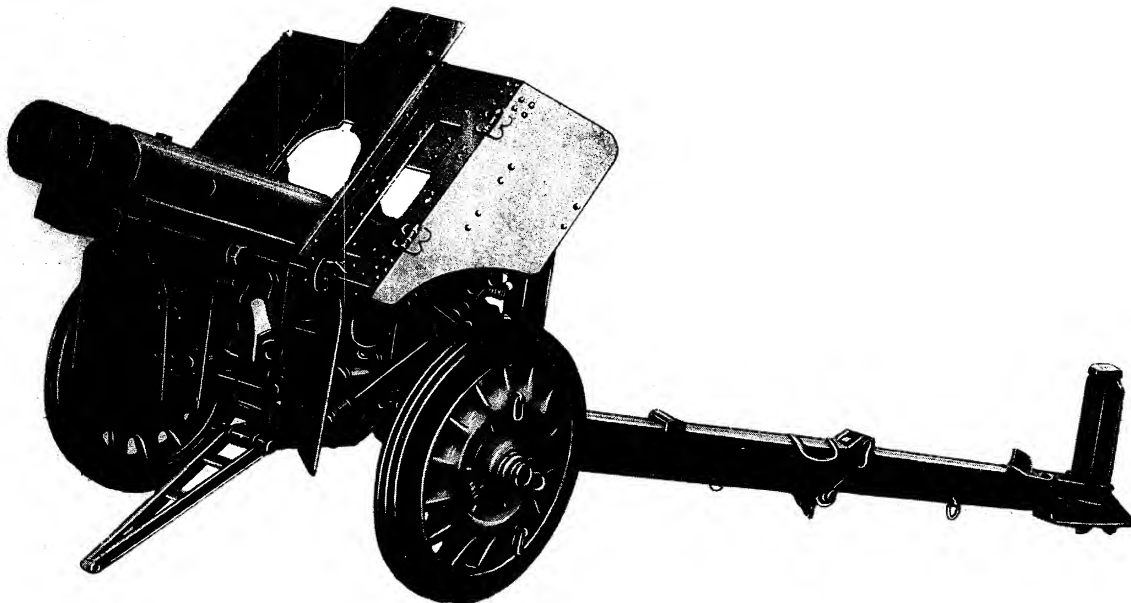


Fig. 6 — MOUNTAIN GUN 76 mm M. 48 B1A2 — View in combat position from the left front side

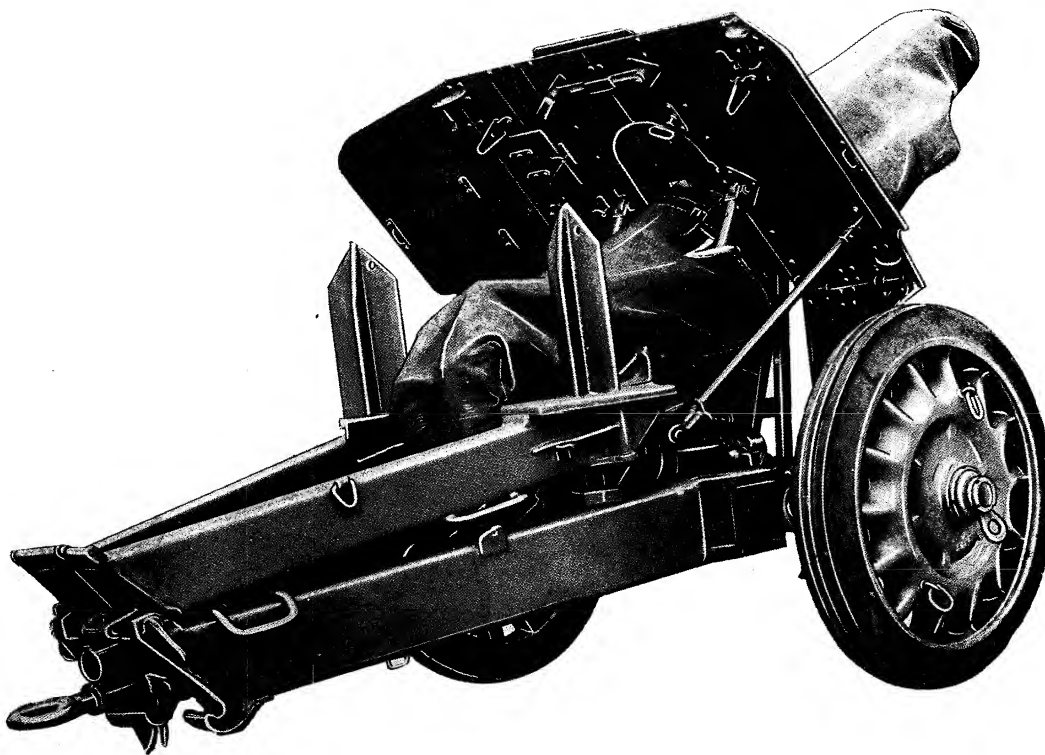


Fig. 7 — MOUNTAIN GUN 76 mm M. 48 B1A2 — in march position with cover

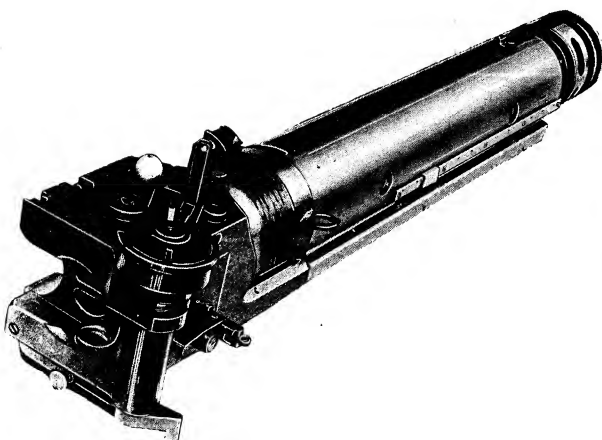


Fig. 8 — BARREL, BREECHING, MANTLE, MUZZLE BRAKE AND BREECH-BLOCK — general view

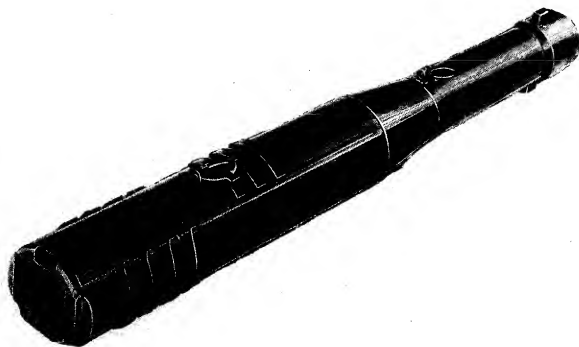


Fig. 9 — BARREL B102 — 11000 — General view

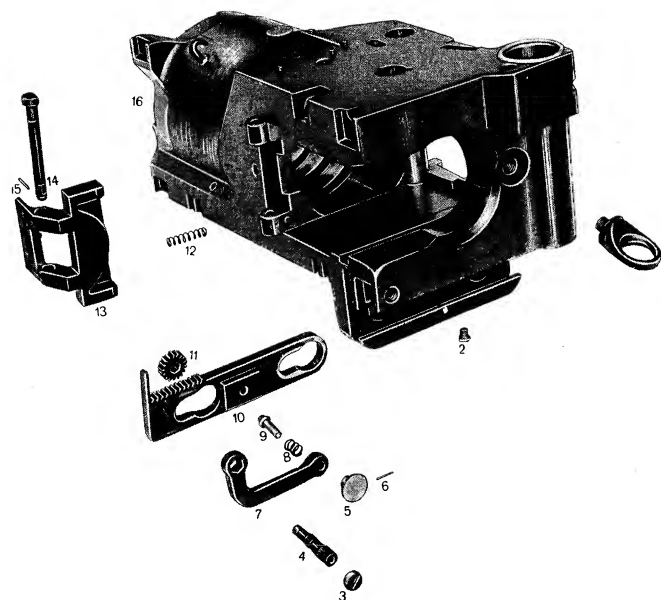


Fig. 10 — BREECHING — DISMANTLED —

- 1 — Eye B102—12004; 2 — Screw B102—12208; 3 — Screw B102—12209;
- 4 — Shaft B102—12205; 5 — Head B102—12202; 6 — Pin B102—12201;
- 7 — Crank lever B102—12207; 8 — Spring B102—12204; 9 — Bolt B102—12203; 10 — Connecting rack B102—12206; 11 — Gear B102—12210; 12 — Spring B102—12104; 13 — Lock B102—12101; 14 — Shaft B102—12105;
- 15 — Pin B102—12103; 16 — Breeching body B102—12007

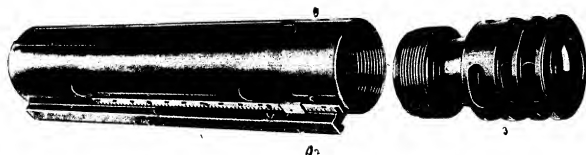


Fig. 11 - MANTLE WITH MUZZLE BRAKE - General view

1 - Mantle B102-13100; 2 - Screw B102-13502; 3 - Muzzle brake body B102-13501

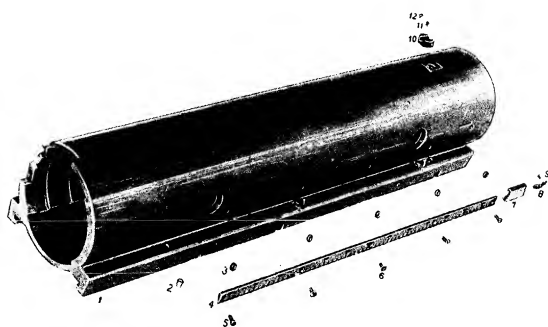


Fig. 12 - MANTLE - DISMANTLED

1 - Mantle body B102-13105; 2 - Lubricator B102-12003; 3 - Washer B102-13302; 4 - Rule B102-13301; 5 - Screw B102-13303; 6 - Screw B102-13304; 7 - Indicator body B102-13402; 8 - Spring B102-13401; 9 - Rivet B102-13403; 10 - Support B102-13202; 11 - Front sight B102-13201; 12 - Screw B102-13203

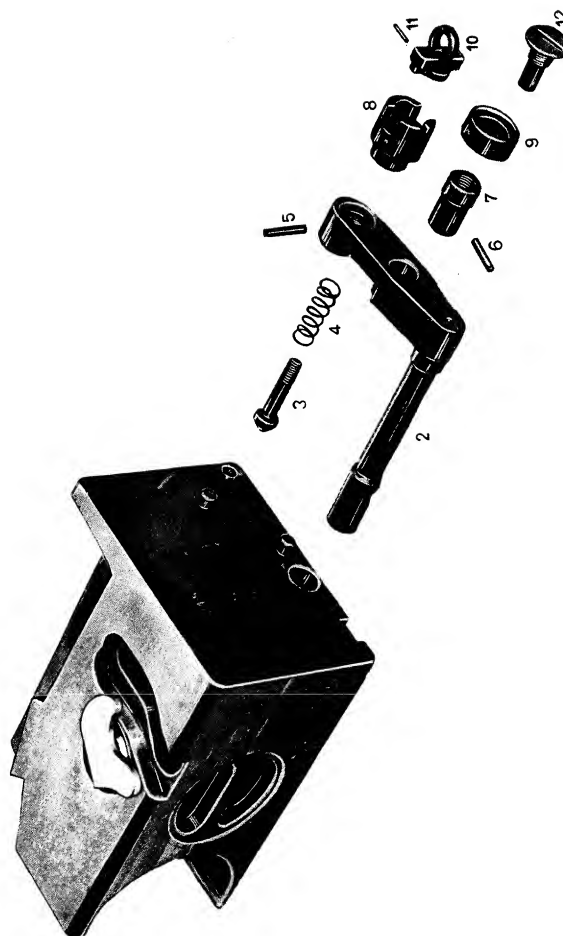


Fig. 13 - BREACHBLOCK WITH DISMANTLED TRIGGERING PARTS

1 - Breechblock body B102-14001; 2 - Trigger shaft B102-14536; 3 - Lock bolt B102-14511; 4 - Screw B102-14512; 5 - Pin B102-14513; 6 - Pin B102-14514; 7 - Pin B102-14515; 8 - Pin B102-14516; 9 - Pin B102-14517; 10 - Pin B102-14518; 11 - Pin B102-14519; 12 - Pin B102-14520

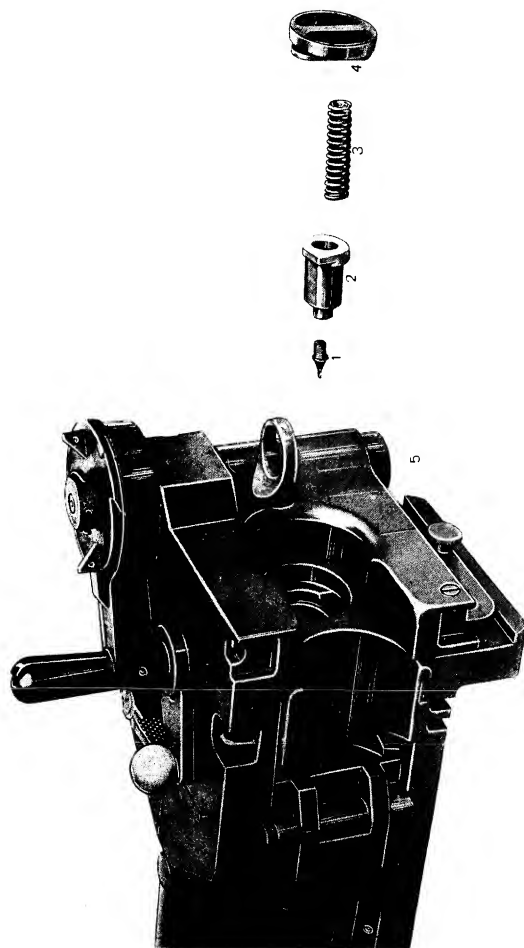


Fig. 14 - FIRING PARTS - DISMANTLED
1 - Firing pin B102-1401; 2 - Striker B102-14107; 3 - Spring B102-14105; 4 - Back plate B102-14104;
5 - Breech block with breechblock

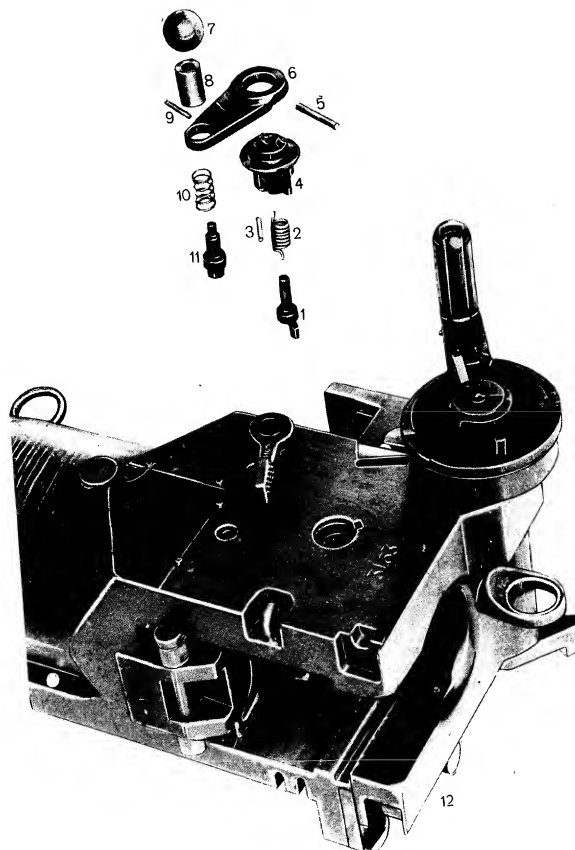


Fig. 15 - RECOCKING HANDLE - DISMANTLED
1 - Recocking shaft B102-14211; 2 - Spring B102-14207; 3 - Pin B102-14203; 4 - Casing B102-14201; 5 - Pin B102-14205; 6 - Lever B102-14208; 7 - Handgrip B102-14210; 8 - Bushing B102-14202; 9 - Pin B102-14204; 10 - Spring B102-14208; 11 - Handle plug B102-14206; 12 - Breechring

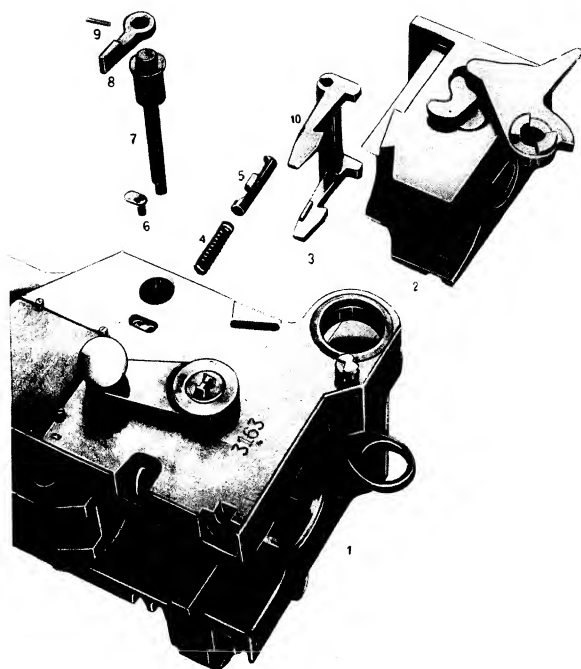


Fig. 16 — EXTRACTING PARTS — DISMANTLED

1 — Breechring-assembled; 2 — Breechblock body B102-14001; 3 — Lower extractor B102-14303; 4 — Spring B102-14402; 5 — Lock bolt B102-14403; 6 — Lock stop B102-14401; 7 — Extractor shaft B102-14304; 8 — Lever B102-14305; 9 — Pin — B102-14301; 10 — Upper extractor B102-14302

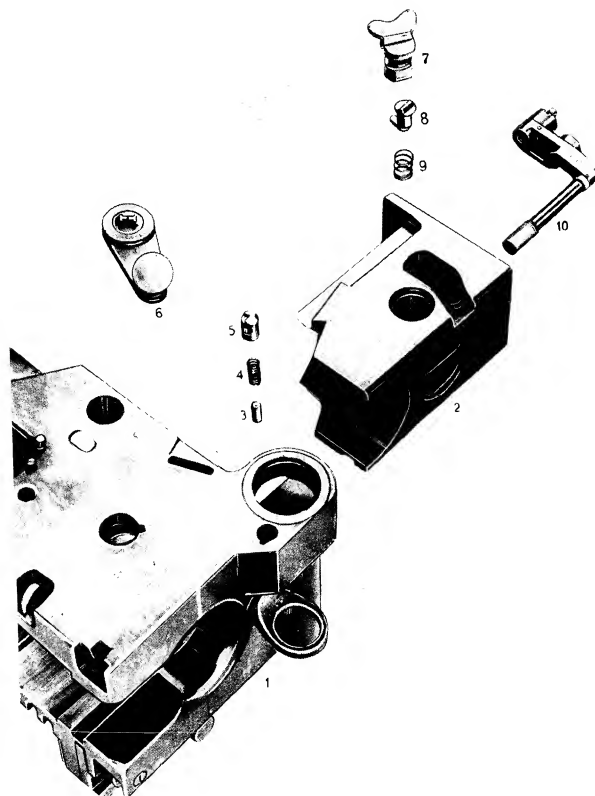


Fig. 17 — BREECHBLOCK WITH TRIGGERING PARTS

1 — Breechring body B102-12007; 2 — Breechblock body B102-14001; 3 — Guide B102-14702; 4 — Spring B102-14701; 5 — Tooth B102-14703; 6 — Recocking handle-assembled; 7 — Sear B105-14108; 8 — Trigger B102-14516; 9 — Spring B102-14518; 10 — Trigger — assembled

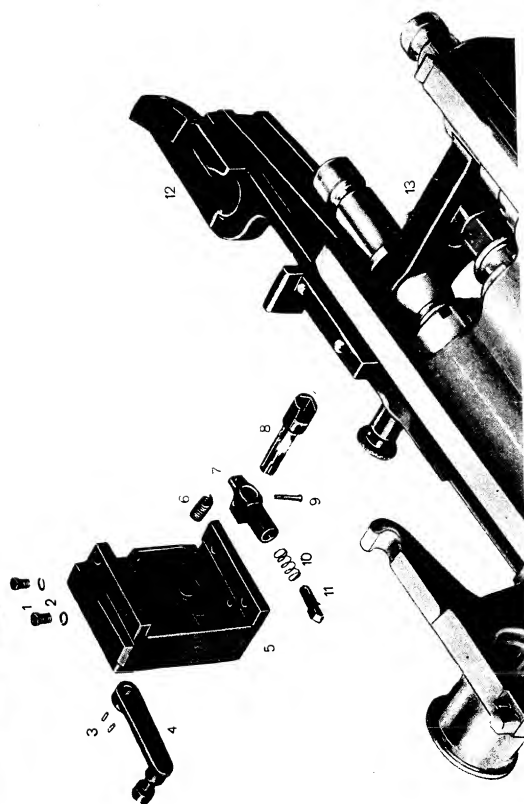


Fig. 18 — TRIGGERING PARTS CASING

1 — Screw B102-14534; 2 — Washer B102-14524; 3 — Pin B102-14505; 4 — Handle B102-14530; 5 — Handle B102-14530; 6 — Pin B102-14505; 7 — Pin B102-14505; 8 — Pin B102-14505; 9 — Pin B102-14505; 10 — Pin B102-14505; 11 — Pin B102-14505; 12 — Pin B102-14505; 13 — Pin B102-14505

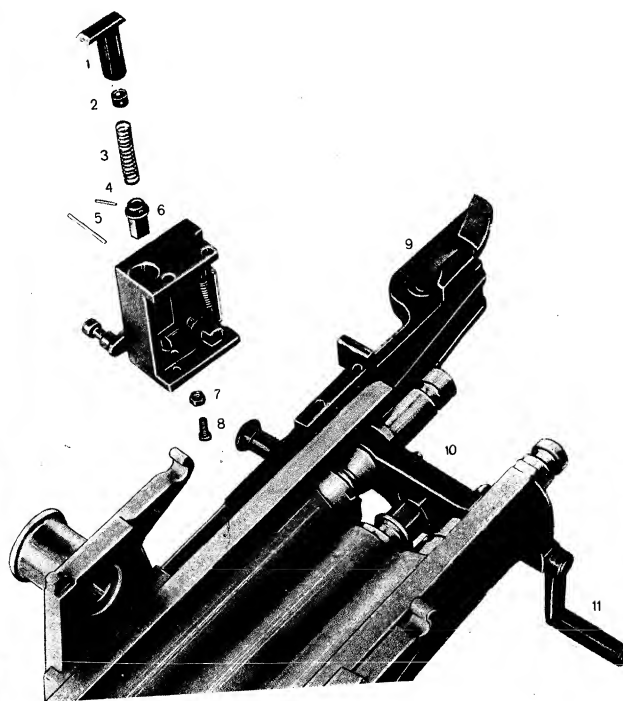


Fig. 19 — TRIGGERING PARTS CASING

1 — Lifter B102-14510; 2 — Ring B102-14529; 3 — Spring B102-14522; 4 — Pin B102-14507; 5 — Pin B102-14508; 6 — Pusher B102-14528; 7 — Pin B102-14507; 8 — Pin B102-14507; 9 — Pin B102-14507; 10 — Pin B102-14507; 11 — Pin B102-14507

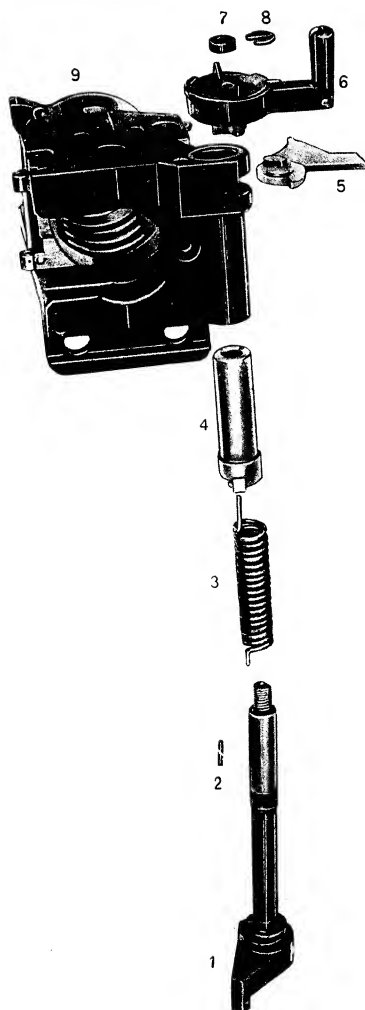


Fig. 20 — BREECHBLOCK OPE-
RATING PARTS

- 1 — Shaft B102—14610;
- 2 — Key B102—14603;
- 3 — Spring B102—14607;
- 4 — Bushing B102—14601;
- 5 — Guide B102—14618;
- 6 — Handle B102—14614;
- 7 — Nut B102—14606;
- 8 — Safety pin B102—14616;
- 9 — Breechring

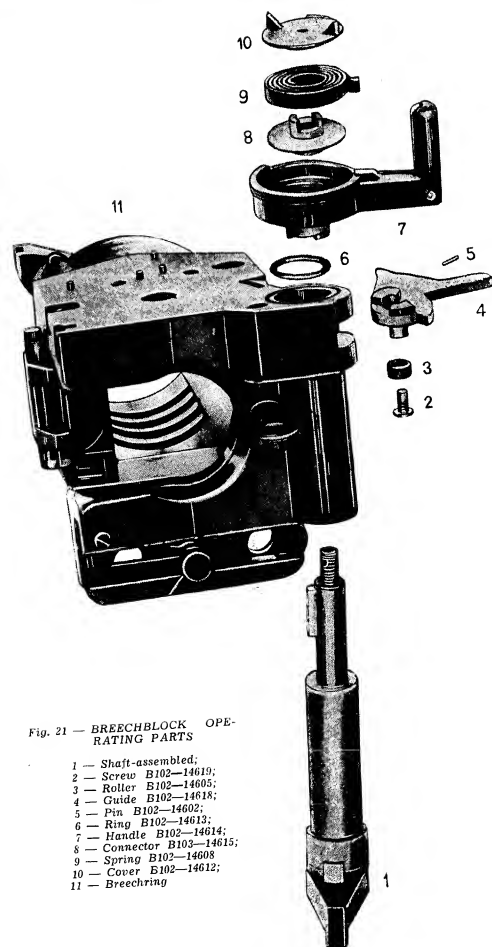


Fig. 21 — BREECHBLOCK OPE-
RATING PARTS

- 1 — Shaft-assembled;
- 2 — Screw B102—14619;
- 3 — Roller B102—14605;
- 4 — Guide B102—14618;
- 5 — Pin B102—14602;
- 6 — Ring B102—14613;
- 7 — Handle B102—14614;
- 8 — Connector B103—14615;
- 9 — Spring B102—14608;
- 10 — Cover B102—14612;
- 11 — Breechring



Fig. 22 — OPERATING HANDLE WITH CIRCULAR BOX AND LOCK-DISMANTLED

1 — Handle B102-14614; 2 — Lock pin B102-14617; 3 — Lock B102-14604; 4 — Shaft B102-14611; 5 — Spring B102-14609

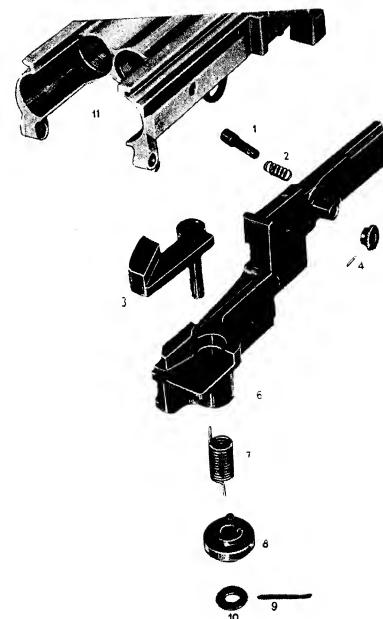


Fig. 23 — OPERATING CAM — DISMANTLED

1 — Fastening bolt B102-14803; 2 — Spring B102-14806; 3 — Cam crank B102-14809; 4 — Pin B102-14806; 5 — Head B102-14801; 6 — Operating cam B102-14814; 7 — Spring B102-14805; 8 — Ring B102-14808; 9 — Cotter pin B102-14828; 10 — Washer B102-14807; 11 — Cradle

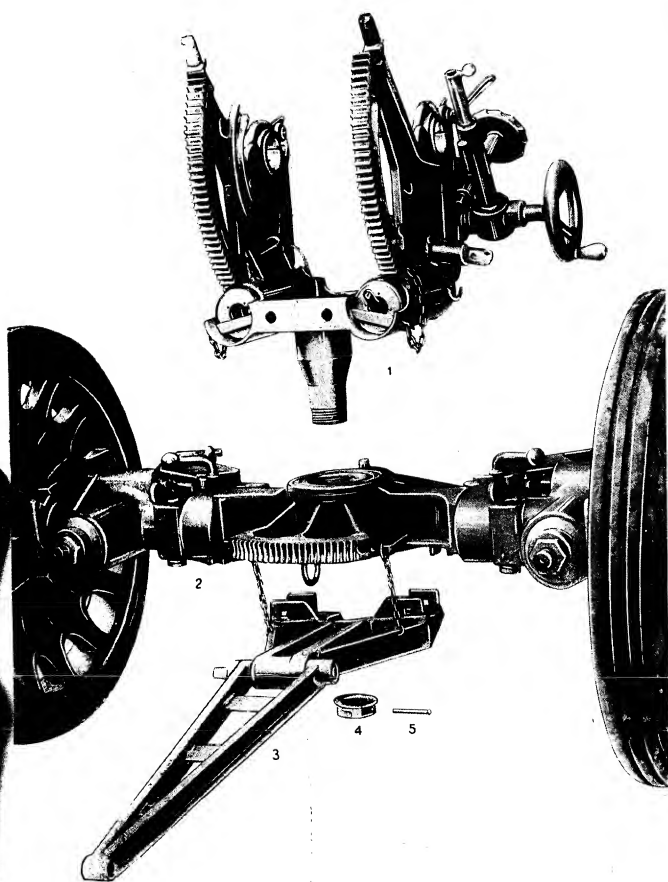


Fig. 24 - CARRIAGE

1 - Top carriage B102-15000; 2 - Bottom carriage; 3 - Cradle stay;
4 - Pivot nut B102-15018; 6 - Pin B102-15003



Fig. 25 - TOP CARRIAGE - DISMANTLED

1 - Lower bearing B102-15013; 2 - Screw B102-15041; 3 - Upper bearing B102-15012; 4 - Lock bolt stop B102-15004; 5 - Cover B102-15028; 6 - Pin B102-15002; 7 - Lock bolt B102-15005; 8 - Handle B102-15030; 9 - Shaft B102-15022; 10 - Lubricator B102-12003; 11 - Shaft B102-15021; 12 - Nut B102-15015; 13 - Sector B102-15032; 14 - Screw B102-15038; 15 - Carriage

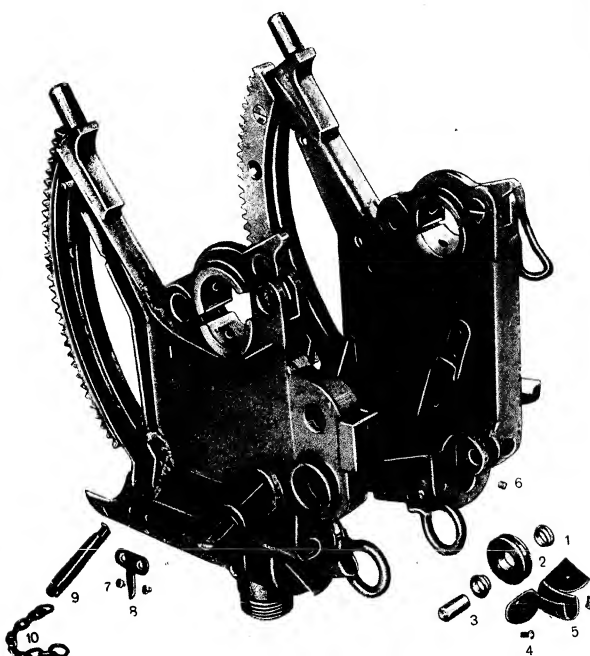


Fig. 26 - TOP CARRIAGE - DISMANTLED

1 - Bearing bushing B102-15014; 2 - Pulley B102-15007; 3 - Shaft B102-15023; 4 - Screw B102-15043; 5 - Shield B102-15036; 6 - Screw B102-15044; 7 - Screw B102-15042; 8 - Indicator B102-15027; 9 - Lock-out bolt B102-15006; 10 Chain B102-15011

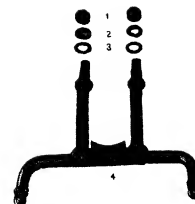


Fig. 27 - LOWER SHIELD BRACKET

1 - Nut B102-15017; 2 - Washer B102-15025;
3 - Washer B102-15026; 4 - Bracket B102-15019

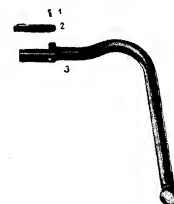


Fig. 28 - GUNNER PROTECTOR - DISMANTLED

1 - Rivet B102-15035; 2 - Spring B102-15020;
3 - Gunner protector B102-15001

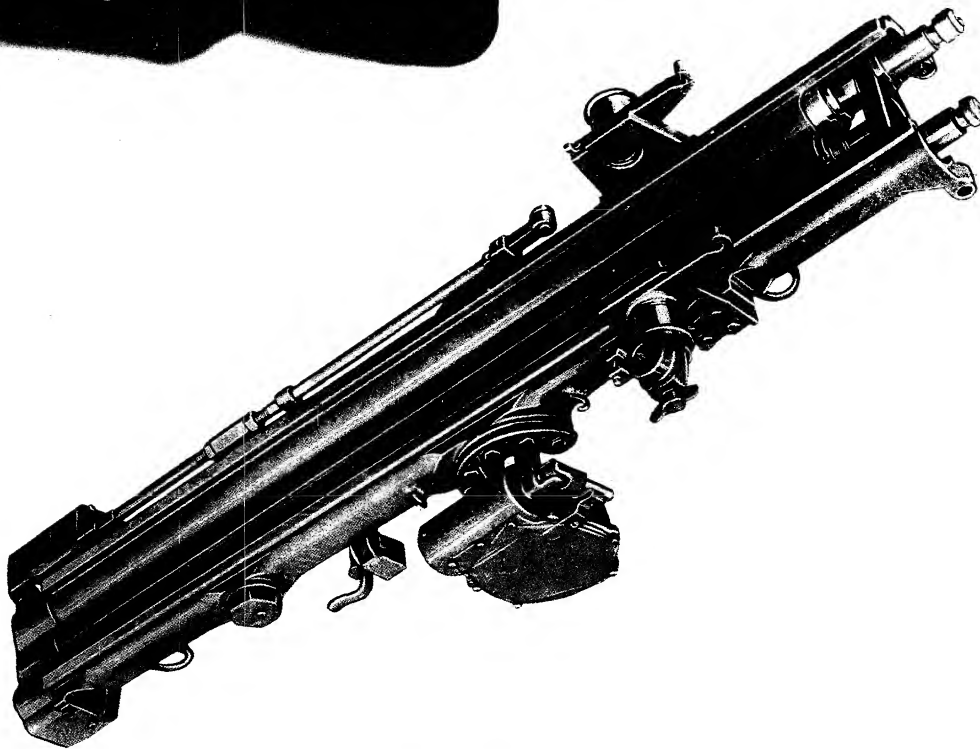


Fig. 29 — CRADLE — GENERAL VIEW

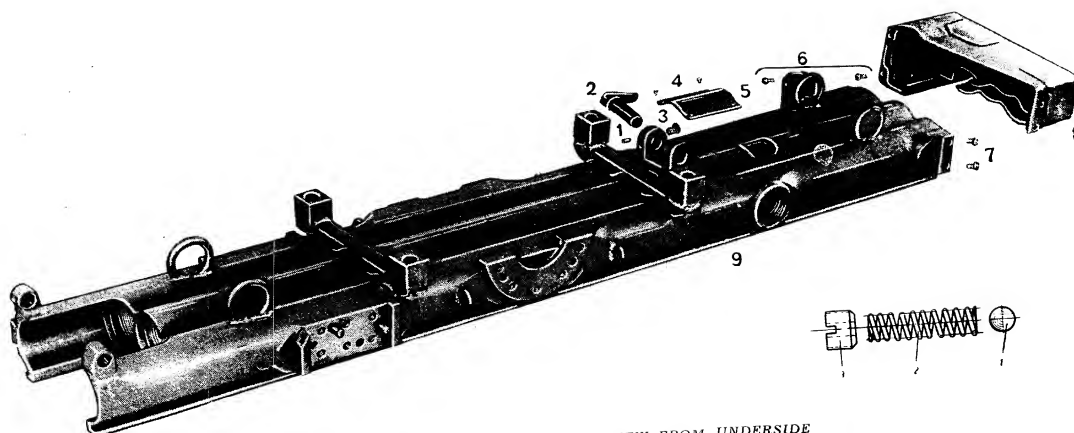


Fig. 30 — GRADLE — DISMANTLED — VIEW FROM UNDERSIDE

- 1 — Screw B102-16005; 2 — Lock bolt B102-16001; 3 — Screw B102-16006; 4 — Screw B102-16009; 5 — Cover B102-16004; 6 — Screw B102-16008; 7 — Screw B102-16007; 8 — Cover B102-16003; 9 — Cradle Body B102-16002; 10 — Screw B102-16006 — dismantled; 1 — Ball, 2 — Spring and 3 — Screw body

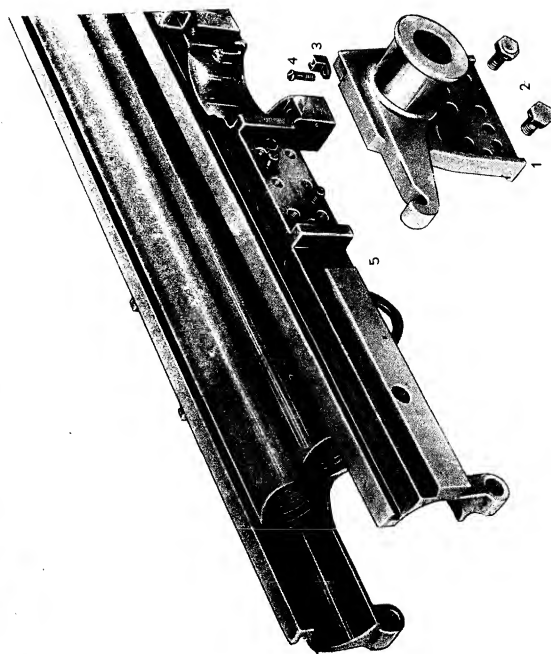


Fig. 31 - CRADLE TRUNNION - RIGHT - DISMANTLED
1 - Trunnion B102-16103; 2 - Screw B102-16105; 3 - Latch B102-16104; 4 - Screw B102-16105; 5 - Cradle body B102-16102

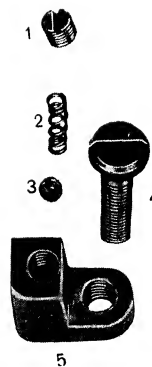


Fig. 32 - RECOIL LENGTH LATCH - DISMANTLED
1 - Screw B102-16106; 2 - Spring B102-16102;
3 - Ball B102-16101; 4 - Screw B102-16105;
5 - Latch B102-16104

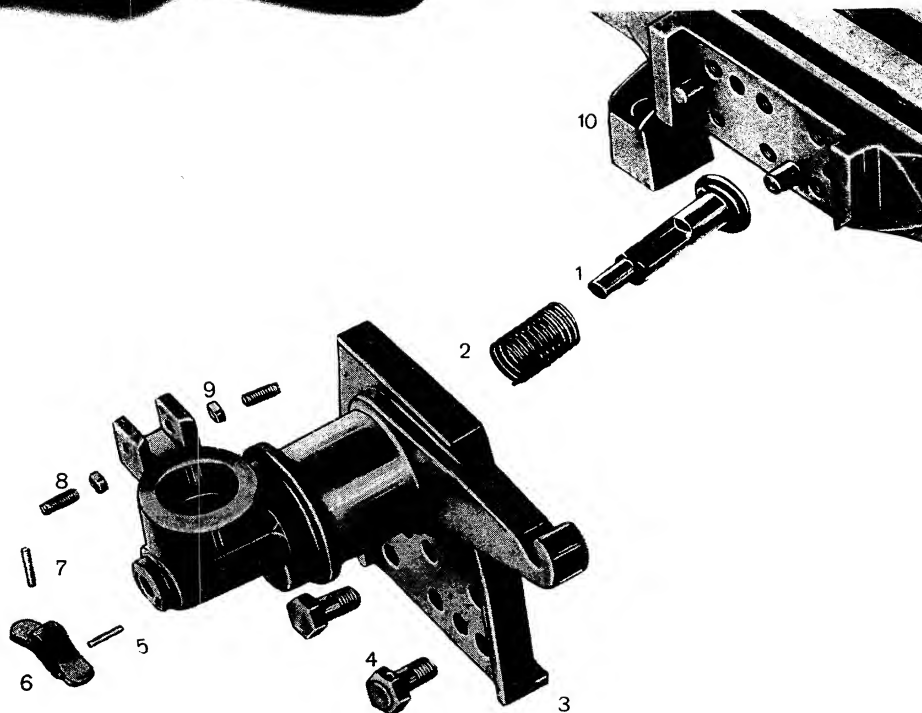


Fig. 33 — GRADLE TRUNNION — LEFT — DISMANTLED

1 — Fastener B102—16207; 2 — Spring B102—16204; 3 — Trunnion B102—16205; 4 — Screw B102—16107; 5 — Stop pin B102—16202; 6 — Handle B102—16206; 7 — Pin B102—16201; 8 — Screw B102—16208; 9 — Nut B102—16203; 10 — Gradle B102—16002

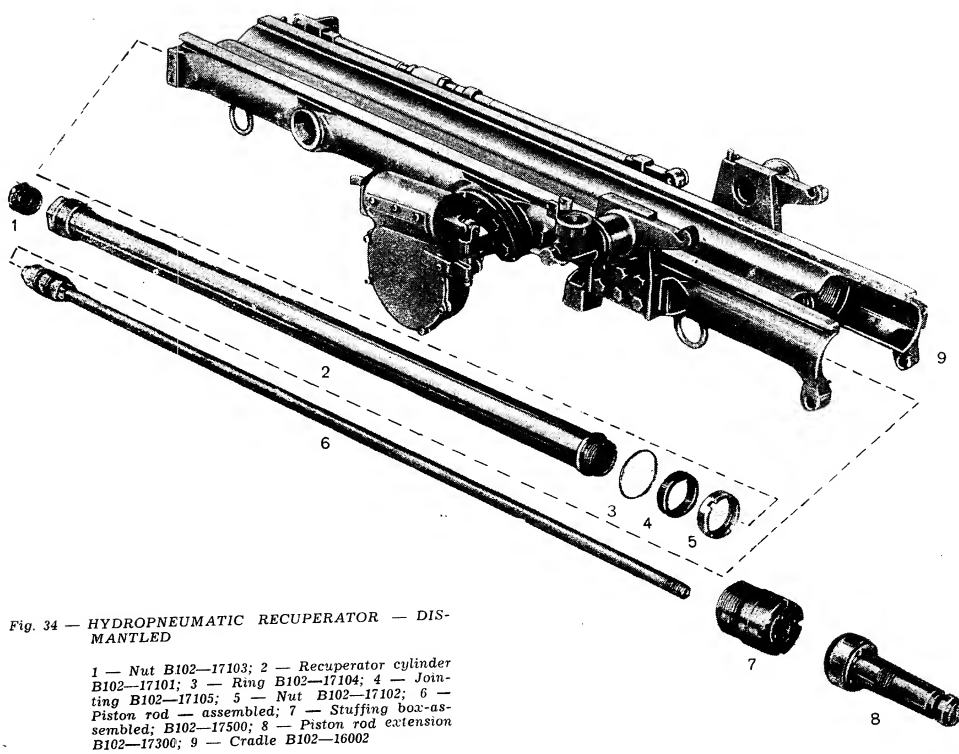


Fig. 34 — HYDROPNEUMATIC RECUPERATOR — DISMANTLED

1 — Nut B102—17103; 2 — Recuperator cylinder B102—17101; 3 — Ring B102—17104; 4 — Joining B102—17105; 5 — Nut B102—17102; 6 — Piston rod — assembled; 7 — Stuffing box — assembled; B102—17500; 8 — Piston rod extension B102—17300; 9 — Cradle B102—16002

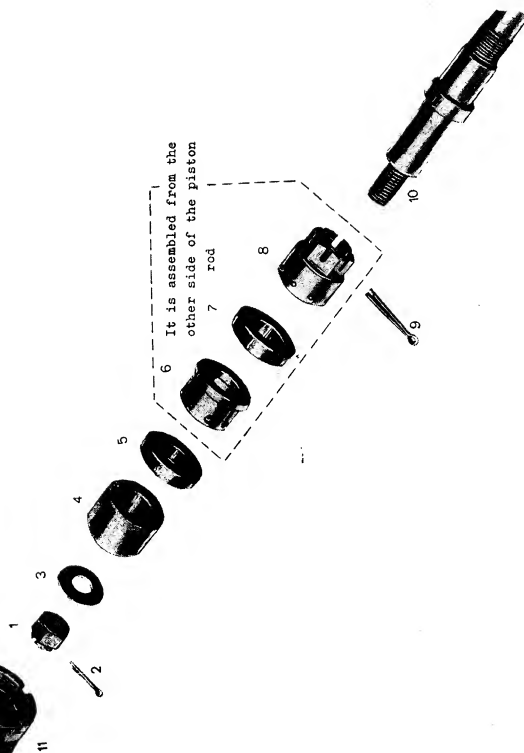


Fig. 35 — RECUPERATOR CYLINDER WITH PISTON AND PISTON ROD — DISMANTLED
 1 — Nut B102-17203; 2 — Washer B102-17205; 3 — Piston body B102-17201; 4 — Pin B102-17301; 5 — Retainer B102-17302; 6 — Extension B102-17304; 7 — Connector body B102-17403; 8 — Nut B102-17401; 9 — Nut B102-17402; 10 — Key B102-18203; 11 — Extension B102-18204; 12 — Bushing B102-18201; 13 — Pin B102-18202; 14 — Piston rod B102-18101; 15 — Piston rod B102-17201

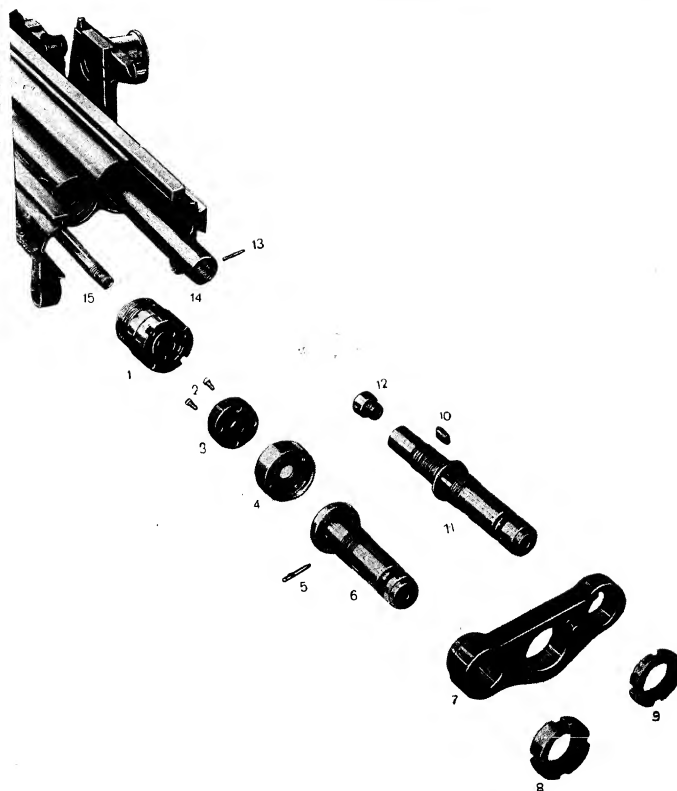


Fig. 36 — RECUPERATOR PISTON ROD EXTENSION AND RECOIL BRAKE CONNECTOR — DISMANTLED

- 1 — Stuffing box B102-17500; 2 — Screws B102-17305; 3 — Buffer B102-17303; 4 — Retainer B102-17302; 5 — Pin B102-17301; 6 — Extension B102-17304; 7 — Connector body B102-17403; 8 — Nut B102-17401; 9 — Nut B102-17402; 10 — Key B102-18203; 11 — Extension B102-18204; 12 — Bushing B102-18201; 13 — Pin B102-18202; 14 — Piston rod B102-18101; 15 — Piston rod B102-17201

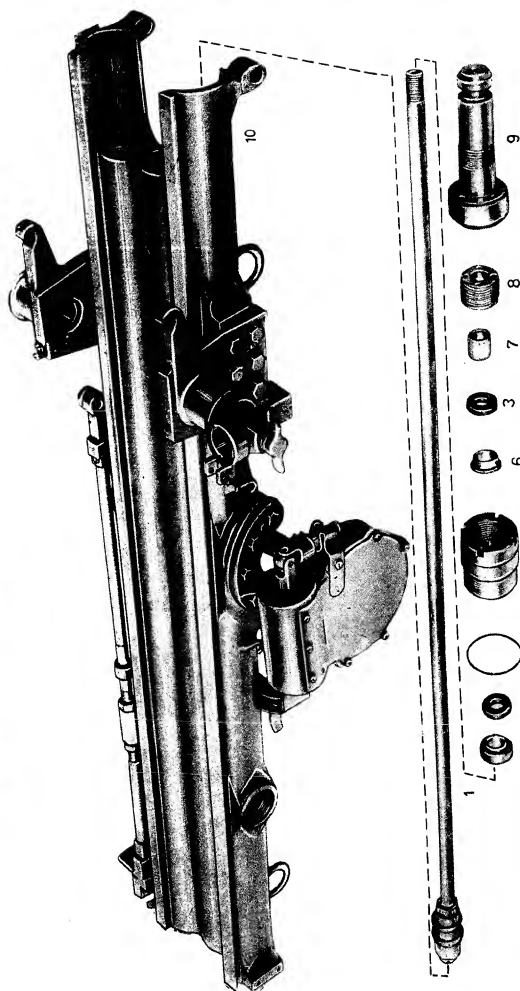


FIG. 37 — RECUPERATOR CYLINDER STUFFING BOX — DISMANTLED
1 — Recuperator piston rod with piston-assembly; 2 — Nut B102-17503; 3 — Packing B102-17507; 4 — Bearing bushing B102-17502; 5 — Box body B102-17501; 6 — Extension-assembly; 7 — Seal B102-17504; 8 — Ring B102-17505; 9 — Screw B102-17506; 10 — Cradle



FIG. 38 — RECUPERATOR FILLING VALVE — DISMANTLED
1 — Ring B102-17606; 2 — Valve body B102-17602; 3 — Seal B132-17609; 4 — Plug B102-17607; 5 — Ring B102-17601; 6 — Nut B102-17605; 7 — Packing B102-17608; 8 — Ring B102-17603; 9 — Screw B102-17610; 10 — Cover B102-17604; 11 — Screw B102-17611; 12 — Screw B102-17611; 13 — Cradle

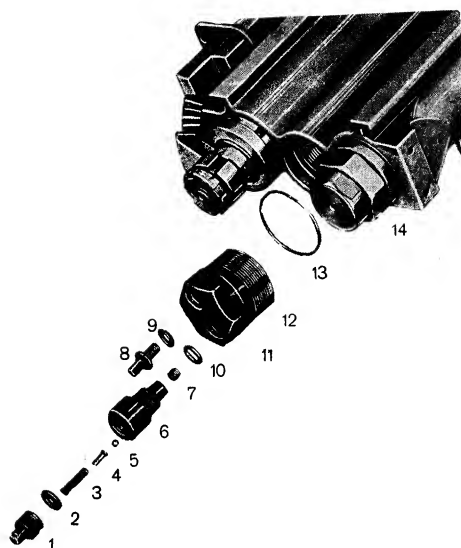


Fig. 39 — COMPENSATOR CYLINDER STUFFING BOX WITH BRAKE FLUID REFILLING VALVE — DISMANTLED

- 1 — Plug B102—18601; 2 — Seal B102—18610; 3 — Spring B102—18605;
4 — Retainer B102—18606; 5 — Ball B102—18603; 6 — Valve body B102—18609; 7 — Screw B102—18612; 8 — Plug B102—18602; 9 — Seal B102—18611; 10 — Ring B102—18608; 11 — Screw B102—18613; 12 — Stuffing box B102—18604; 13 — Ring B102—18607; 14 — Cradle

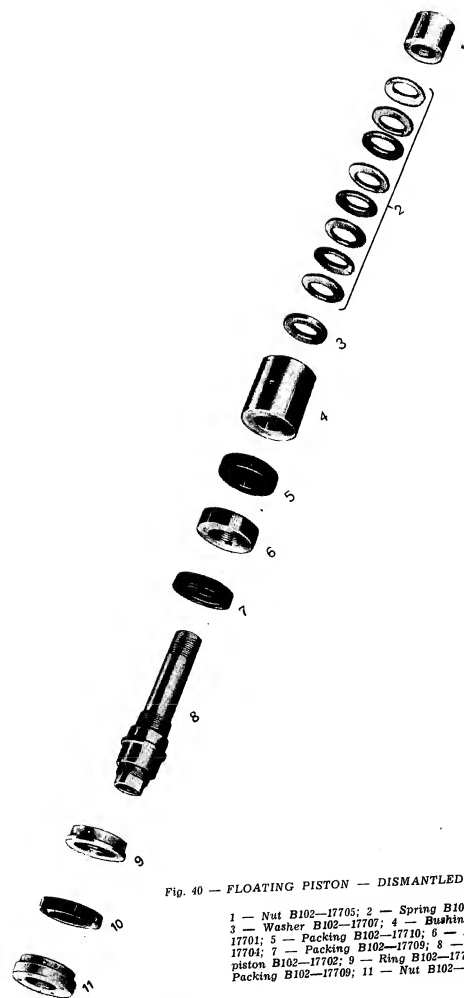


Fig. 40 — FLOATING PISTON — DISMANTLED

- 1 — Nut B102—17705; 2 — Spring B102 17706;
3 — Washer B102—17707; 4 — Bushing B102—17701; 5 — Packing B102—17710; 6 — Nut B102—17704; 7 — Packing B102—17709; 8 — Floating piston B102—17702; 9 — Ring B102—17708; 10 — Packing B102—17709; 11 — Nut B102—17703

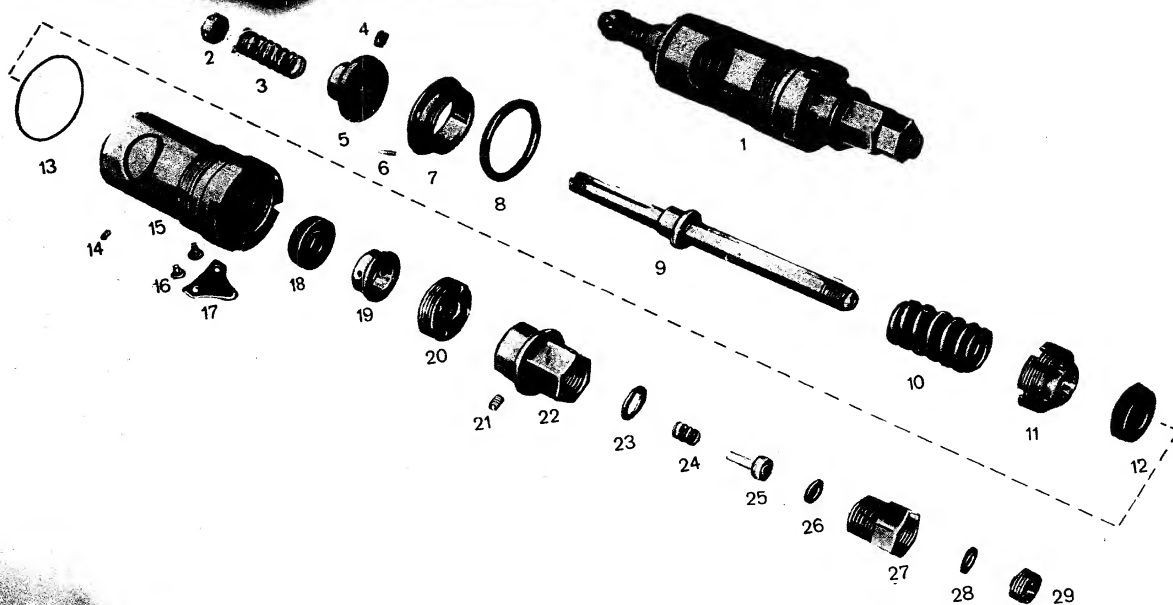


Fig. 41 — COUNTERRECOIL SPEED REGULATOR — DISMANTLED

1 — Speed regulator-assembly B102-17800; 2 — Nut B102-17807; 3 — Spring B102-17810; 4 — Screw B102-17825; 5 — Valve B102-17818; 6 — Screw B102-17824; 7 — Nut B102-17806; 8 — Packing B102-17821; 9 — Shaft B102-17811; 10 — Spring B102-17809; 11 — Nut B102-17805; 12 — Packing B102-17820; 13 — Ring B102-

17815; 14 — Screw B102-16009; 15 — Regulator body B102-17816; 16 — Screw B102-17823; 17 — Indicator B102-17812; 18 — Packing B102-17507; 19 — Ring B102-17813; 20 — Nut B102-17803; 21 — Screw B102-17822; 22 — Nut B102-17804; 23 — Ring B102-17814; 24 — Spring B102-17809; 25 — Valve B102-17817; 26 — Packing B102-17819; 27 — Nut B102-17805; 28 — Packing B102-17820; 29 — Plug B102-17801

Fig. 42 — PISTON ROD WITH PISTON AND COUNTER RECOIL PISTON ROD WITH PISTON — DISMANTLED

1 — Counter-recoil piston rod B102-17302; 2 — Screw B102-18306; 3 — Counter recoil piston B102-18301; 4 — Valve B102-18305; 5 — Spring B102-18303; 6 — Shock absorber B102-18304; 7 — Piston B102-18102; 8 — Screw B102-18103; 9 — Piston rod B102-18101

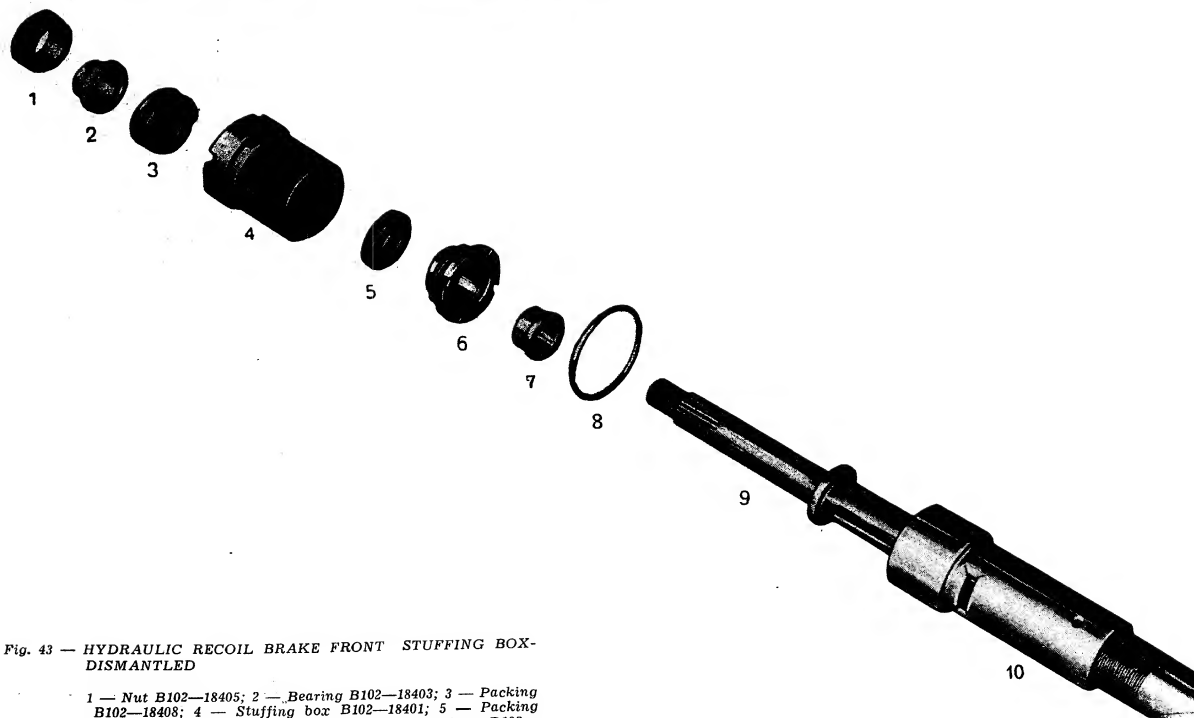


Fig. 43 — HYDRAULIC RECOIL BRAKE FRONT STUFFING BOX-DISMANTLED

1 — Nut B102—18405; 2 — Bearing B102—18403; 3 — Packing B102—18408; 4 — Stuffing box B102—18401; 5 — Packing B102—17208; 6 — Nut B102—18404; 7 — Bearing B102—18402; 8 — Ring B102—18406; 9 — Counter-recoil piston rod B102—18302; 11 — Brake piston rod with piston

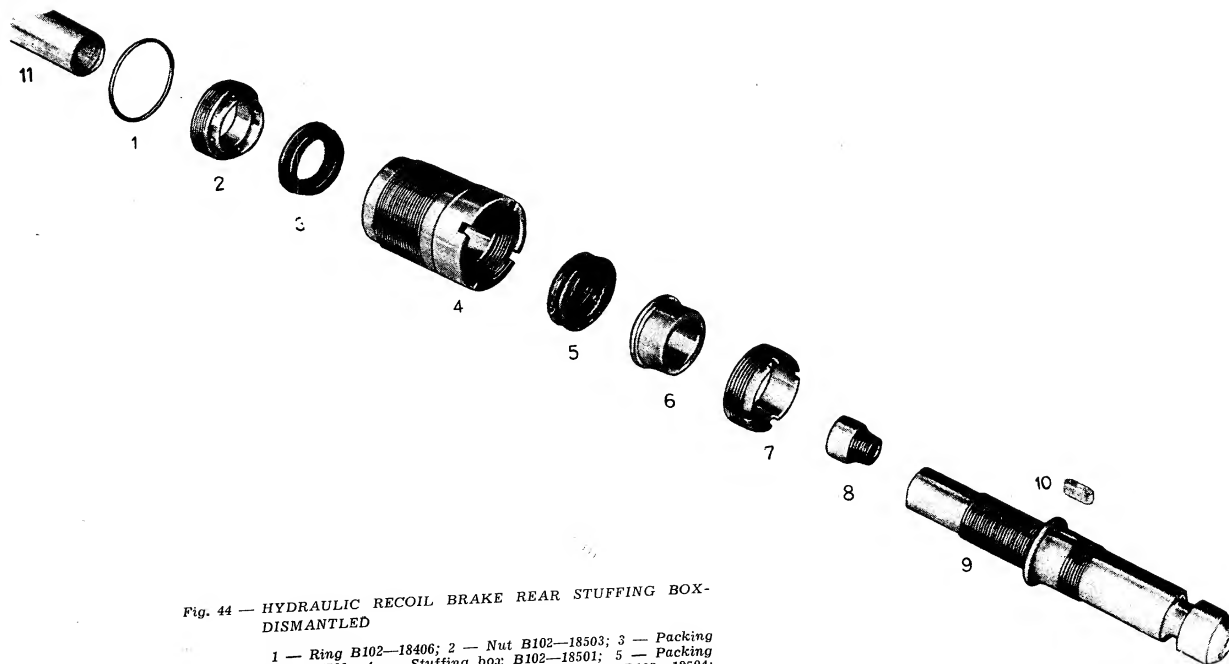


Fig. 44 — HYDRAULIC RECOIL BRAKE REAR STUFFING BOX-DISMANTLED

1 — Ring B102—18406; 2 — Nut B102—18503; 3 — Packing B102—17709; 4 — Stuffing box B102—18501; 5 — Packing B102—18505; 6 — Bearing B102—18502; 7 — Nut B102—18504; 8 — Bushing B102—18201; 9 — Extension B102—18204; 10 — Key B102—18203; 11 — Piston rod B102—18101

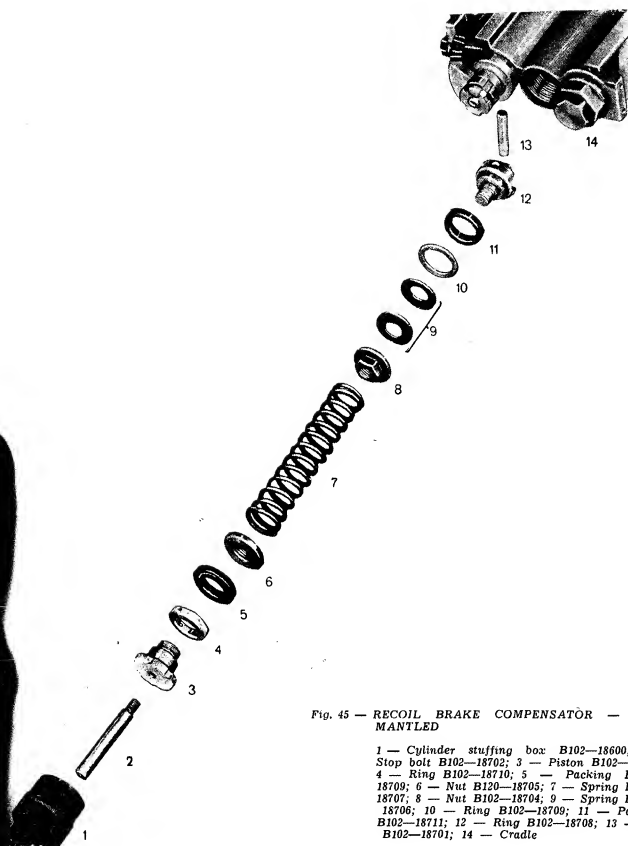


Fig. 45 — RECOIL BRAKE COMPENSATOR — DISMANTLED

- 1 — Cylinder stuffing box B102—18600; 2 — Stop bolt B102—18702; 3 — Piston B102—18703; 4 — Ring B102—18710; 5 — Packing B102—18709; 6 — Nut B102—18705; 7 — Spring B102—18707; 8 — Nut B102—18704; 9 — Spring B102—18706; 10 — Ring B102—18709; 11 — Packing B102—18711; 12 — Ring B102—18708; 13 — Pin B102—18701; 14 — Cradle

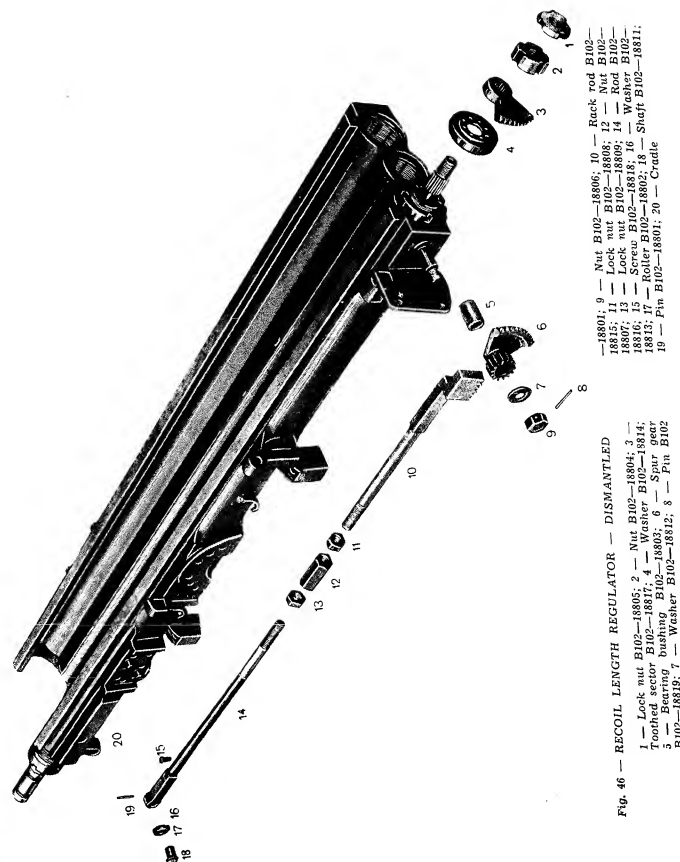


Fig. 46 — RECOIL LENGTH REGULATOR — DISMANTLED

- 1 — Lock nut B102—18805; 2 — Nut B102—18804; 3 — Washer B102—18817; 4 — Washer B102—18814; 5 — Roller B102—18803; 6 — Spring B102—18819; 7 — Washer B102—18812; 8 — Pin B102—18801; 9 — Pin B102—18801; 10 — Pin B102—18801; 11 — Pin B102—18801; 12 — Pin B102—18801; 13 — Pin B102—18801; 14 — Pin B102—18801; 15 — Pin B102—18801; 16 — Pin B102—18801; 17 — Pin B102—18801; 18 — Pin B102—18801; 19 — Pin B102—18801; 20 — Pin B102—18801

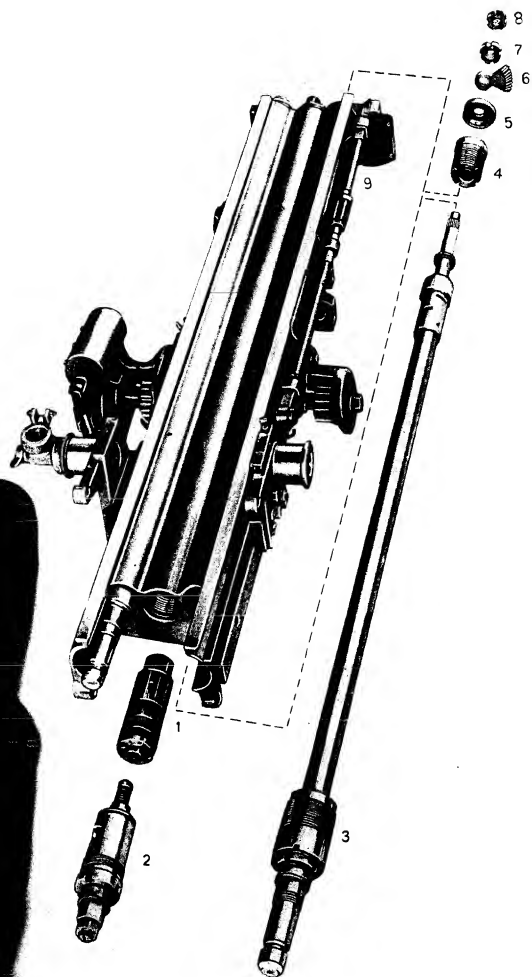


Fig. 47 — CRADLE WITH FLOATING PISTON, REGULATOR, PISTON ROD, COUNTER PISTON ROD AND REAR RECOIL BRAKE STUFFING BOX
1 — Floating piston-assembly B102-17700; 2 — Recoil speed regulator-assembly B102-17800; 3 — Piston rod counter piston and rear recoil brake stuffing box; 4 — Stuffing box body B102-13401; 5 — Washer B102-18814; 6 — Toothed sector B102-18817; 7 — Nut B102-18804; 8 — Lock nut B102-18805; 9 — Cradle

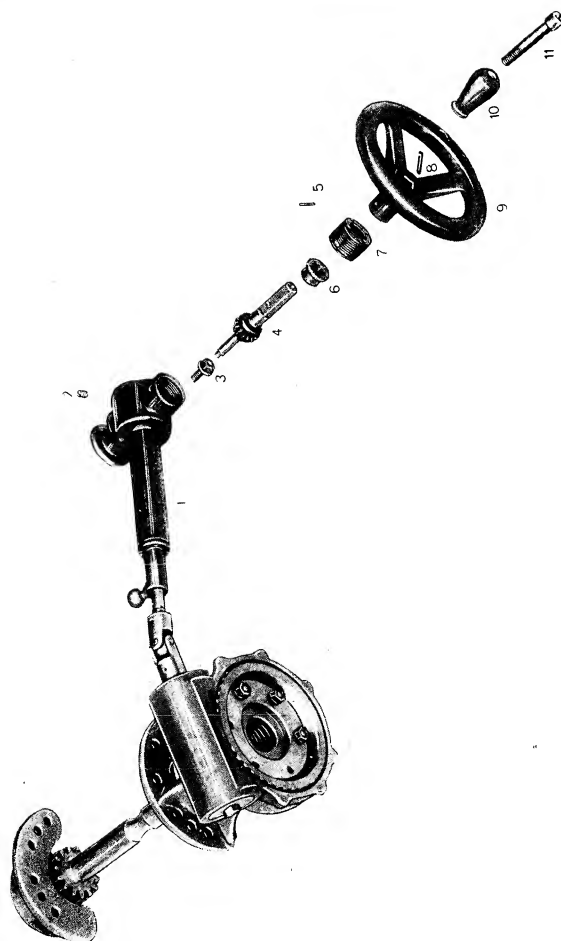


Fig. 48 — ELEVATING MECHANISM WHEEL — DISMANTLED
1 — Casing B102-19105; 2 — Screw B102-19121; 3 — Screw B102-19122; 4 — Shaft B102-19122; 5 — Pin B102-19106; 6 — Nut B102-19108; 7 — Nut B102-19108; 8 — Pin B102-19102; 9 — Wheel B102-19113; 10 — Handgrip B102-19117; 11 — Shaft B102-19113



Fig. 49 — ELEVATING MECHANISM WHEEL — DISMANTLED

1 — Wheel B102-19118; 2 — Bearing bushing B102-19106; 3 — Borel gear B102-19126; 4 — Screw B102-19124; 5 — Cover B102-19116; 6 — Bearing bushing B102-19107; 7 — Screw B102-19123

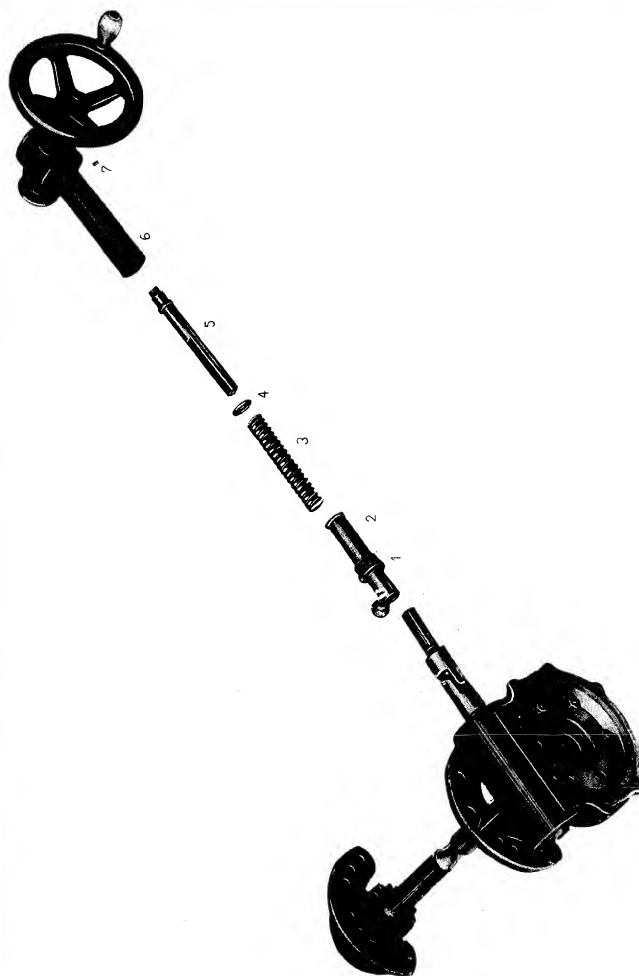


Fig. 50 — ELEVATING MECHANISM SPINDLE — DISMANTLED

1 — Nut B102-19109; 2 — Connector B102-19118; 3 — Spring B102-19111; 4 — Cam B102-19114; 5 — Spindle B102-19120; 6 — Clamping B102-19105; 7 — Screw B102-19123

Fig. 51 — ELEVATING MECHANISM BRACKET — DISMANTLED

1 — Bolt B102—19219; 2 — Bracket B102—19210; 3 — Bearing B102—19206; 4 — Washer B102—19212; 5 — Nut B102—19208; 6 — Pin B102—19201

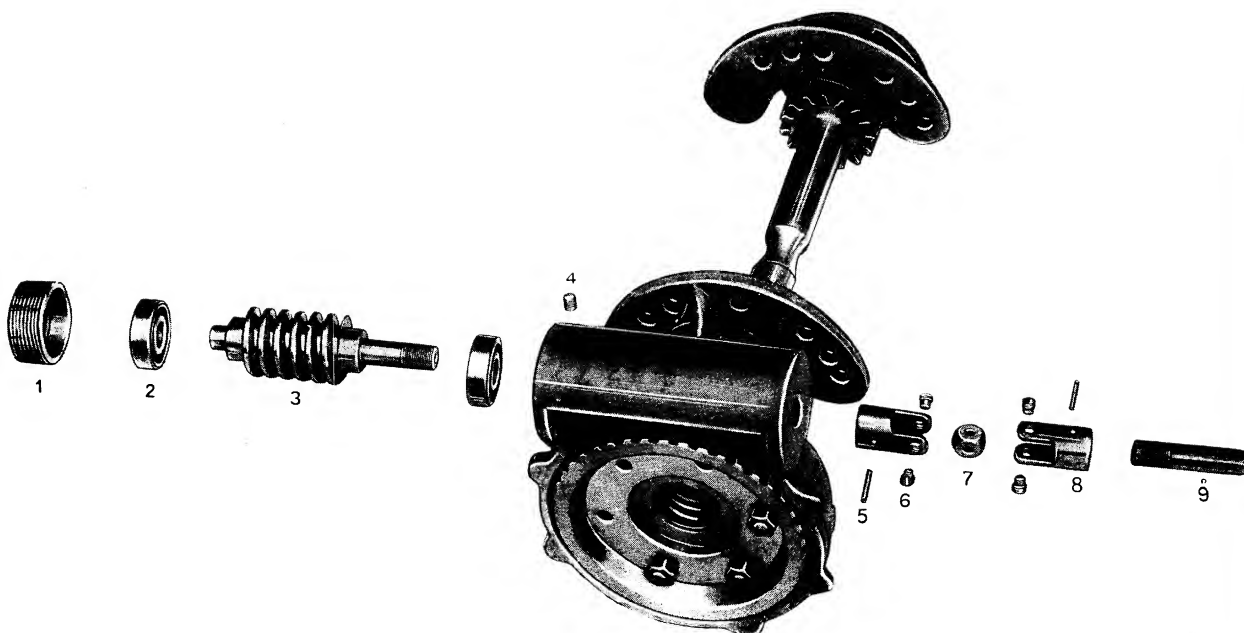
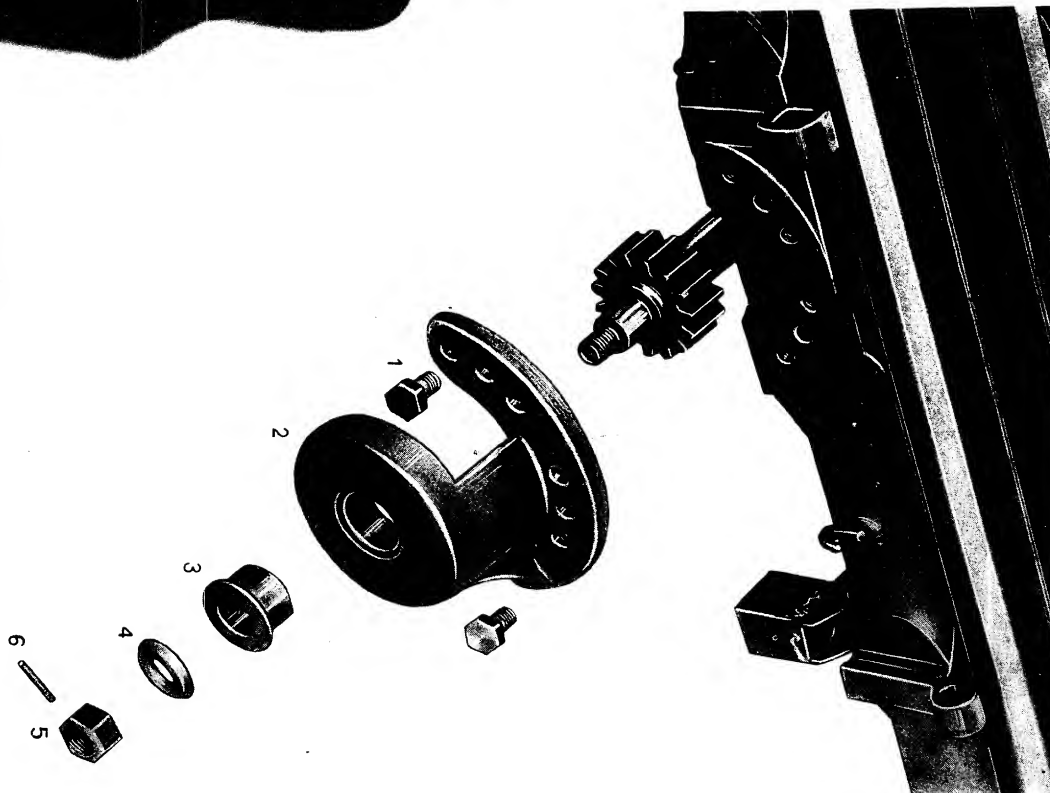


Fig. 52 — ELEVATING MECHANISM WORM — DISMANTLED

1 — Nut B102—19209; 2 — Ball bearing B102—19222; 3 — Worm B102—19215; 4 — Screw B102—19121; 5 — Pin B102—19202; 6 — Screw B102—19221; 7 — Ball B102—19203; 8 — Fork B102—19216; 9 — Spindle B102—19217

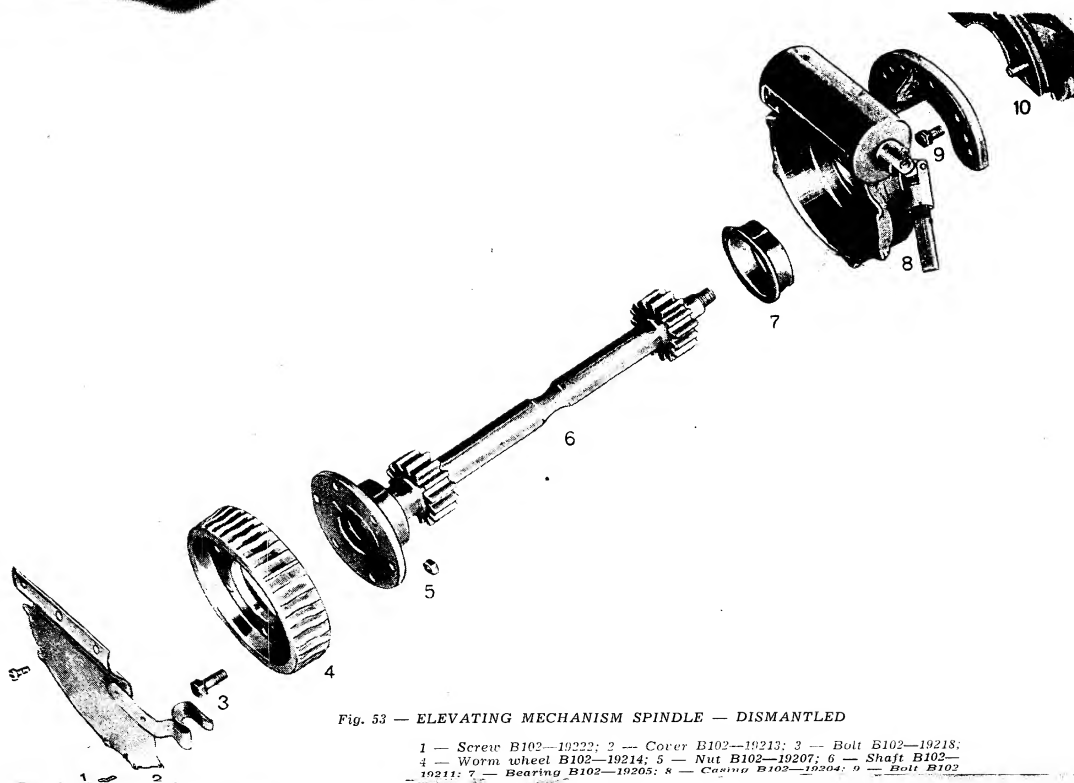


Fig. 53 — ELEVATING MECHANISM SPINDLE — DISMANTLED

1 — Screw B102—19222; 2 — Cover B102—19213; 3 — Bolt B102—19218;
4 — Worm wheel B102—19214; 5 — Nut B102—19207; 6 — Shaft B102—
19211; 7 — Bearing B102—19205; 8 — Casing B102—19204; 9 — Bolt B102—
19211; 10 — Pin B102—19211

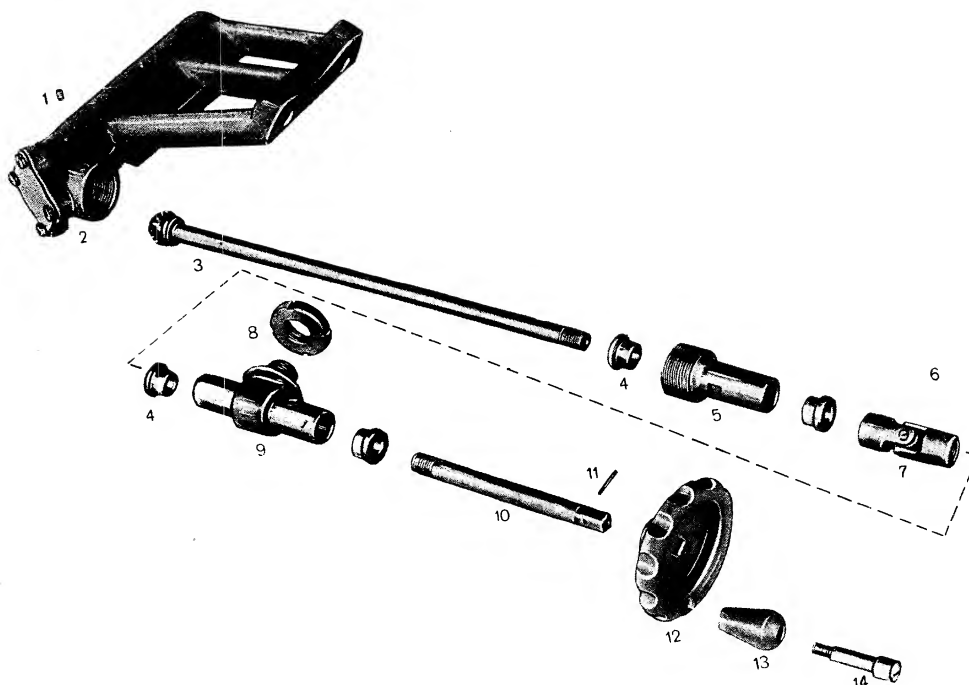


Fig. 54 — TRAVERSING MECHANISM SPINDLE AND WHEEL — DISMANTLED

1 — Bolt B102—19219; 2 — Casing B102—20004; 3 — Spindle B102—20013;
4 — Bearing bushing B102—19106; 5 — Bushing B102—20001; 6 — Pin
B102—19202; 7 — Spindlejoint; 8 — Nut B102—20006; 9 — Bushing B102—
20002; 10 — Shaft B102—20007; 11 — Pin B102—19101; 12 — Hand
wheel B102—20012; 13 — Handgrip B102—20011; 14 — Shaft B102—20008

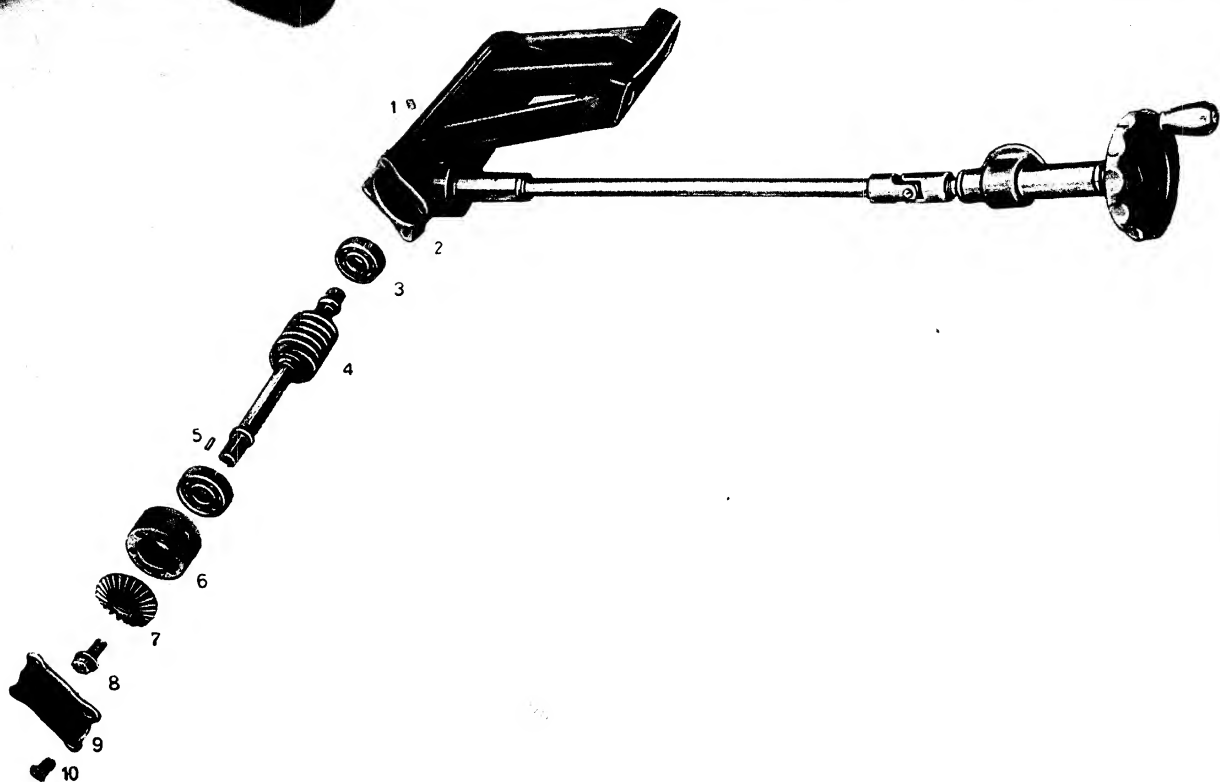


Fig. 55 — TRAVERSING MECHANISM WORM — DISMANTLED

1 — Screw B102—19219; 2 — Casing B102—20004; 3 — Ball bearing B102—20017; 4 — Worm B102—20010; 5 — Key B102—20003; 6 — Nut B102—20005; 7 — Bevel gear B102—20016; 8 — Bolt B102—20014; 9 — Cover B102—20009; 10 — Screw B102—20015

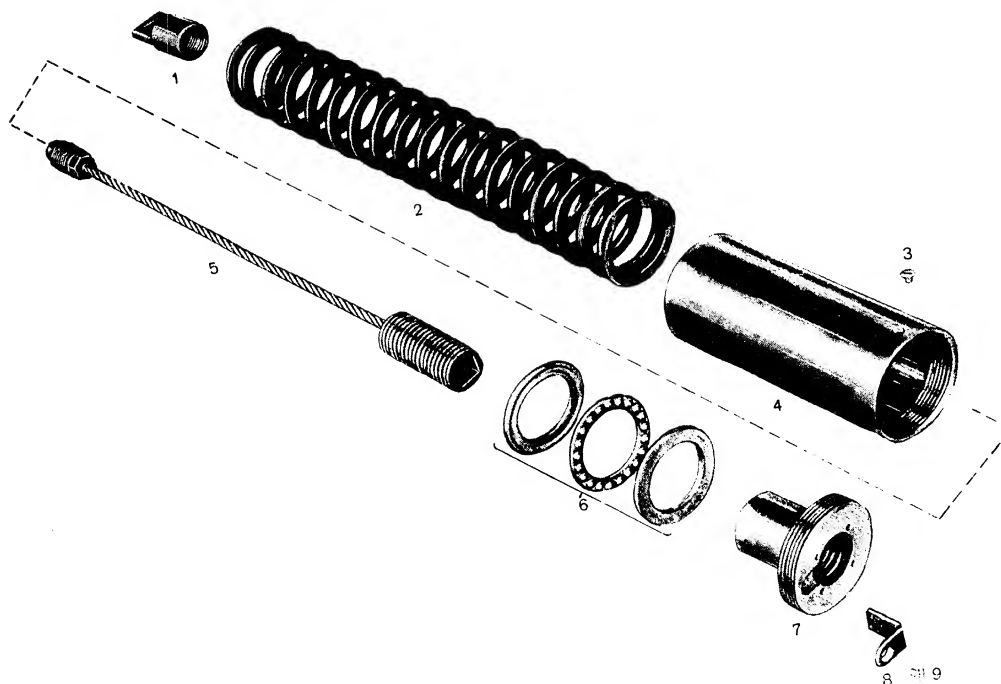


Fig. 56 — EQUILIBRATOR — DISMANTLED

1 — Attaching head B102—21005; 2 — Spring B102—21003; 3 — Screw B102—21006; 4 — Bushing B102—21001; 5 — Steel wire rope-assembled B102—21100; 6 — Ball bearing B102—21008; 7 — Nut B102—21002; 8 — Screw lock B102—21004; 9 — Screw B102—21007

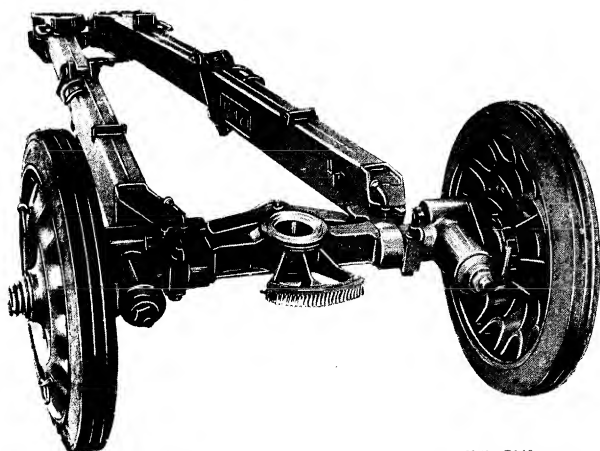


Fig. 57 — BOTTOM CARRIAGE FOR MOUNTAIN GUN 76 mm M.48 BIA2 — GENERAL VIEW

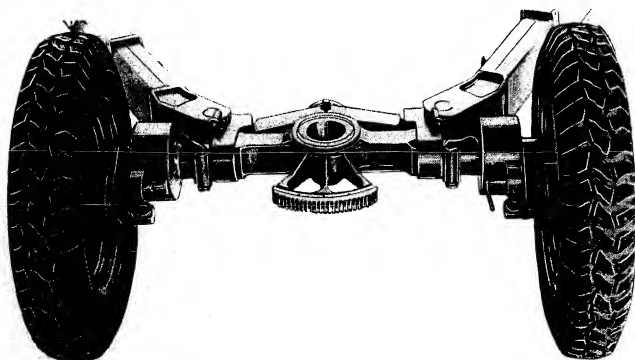


Fig. 58 — BOTTOM CARRIAGE FOR MOUNTAIN GUN 76 mm M.48 BIA1 — GENERAL VIEW

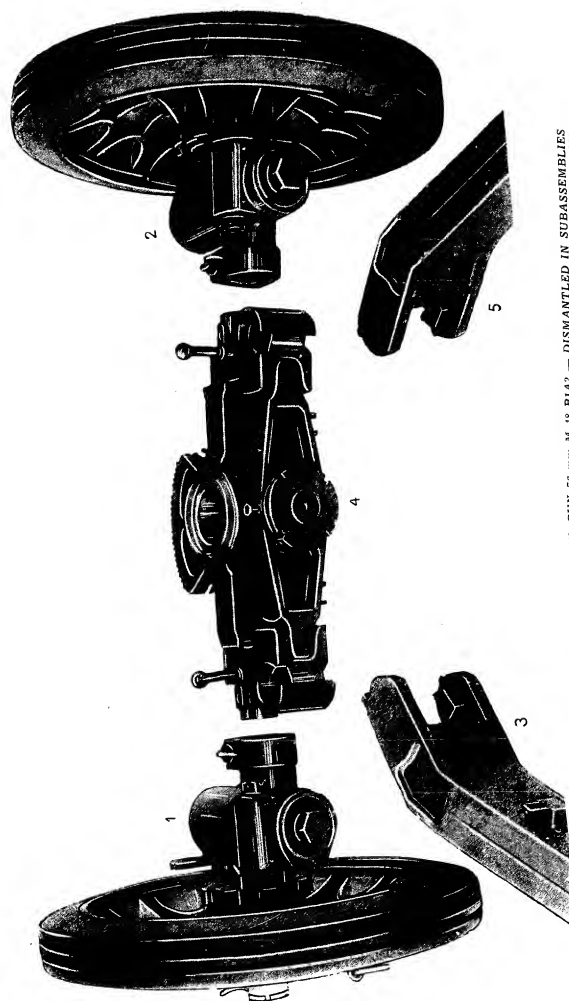


Fig. 59 — BOTTOM CARRIAGE FOR MOUNTAIN GUN 76 mm M.48 BIA2 — DISMANTLED IN SUBASSEMBLIES
1 — Left trail B102-2400; 2 — Right wheel with spring device; 3 — Left trail B102-2400;
4 — Right wheel with spring device; 5 — Axle with equalizer

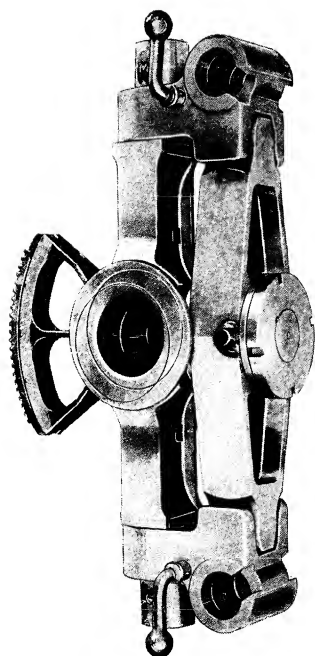


Fig. 60 — AXLE WITH EQUALIZER — GENERAL VIEW

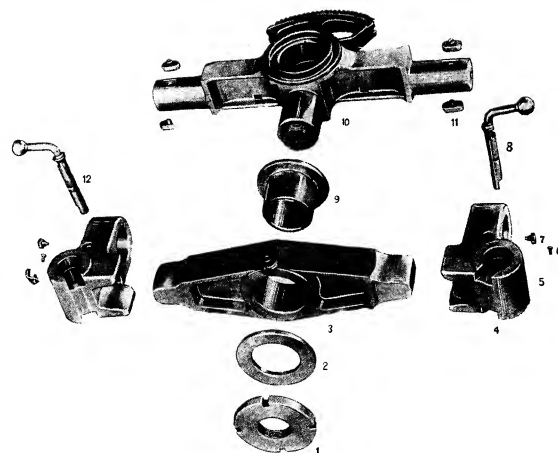


Fig. 61 — AXLE WITH EQUALIZER — DISMANTLED

- 1 — Nut B102—22205; 2 — Washer B102—22207; 3 — Equalizer bar B102—22208; 4 — Equalizer body B102—22201; 5 — Safety lock B102—22206; 6 — Screw B102—22210; 7 — Screw B102—22209; 8 — Right lock bolt B102—22202; 9 — Bearing bushing B102—22204; 10 — Axle body; 11 — Key with screw; 12 — Left lock bolt B102—22203

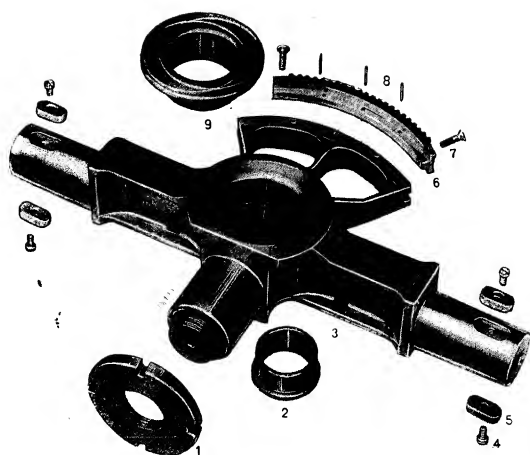


Fig. 62 — AXLE DISMANTLED

1 — Nut — B102—22205; 2 — Bearing — B102—22104; 3 — Axle B102—22105; 4 — Screw B102—22108; 5 — Key — B102—22102; 6 — Sector — B102—22106; 7 — Screw B102—22107; 8 — Pin B102—22101; 9 — Bearing B102—22103;

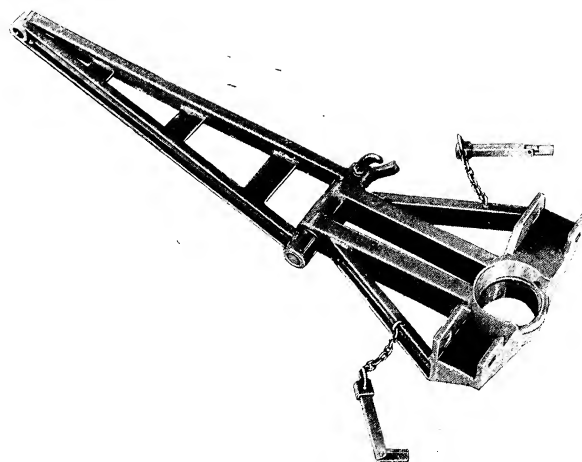


Fig. 63 — CRADLE STAY — GENERAL VIEW

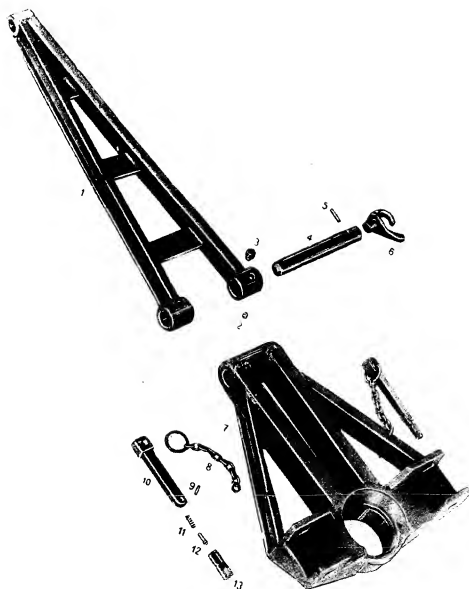


Fig. 64 — CRADLE STAY — DISMANTLED

1 — Cradle stay body B102—23401; 2 — Screw B102—23403; 3 — Screw B102—23402; 4 — Shaft B102—23302; 5 — Pin B102—23301; 6 — Handle B102—23303; 7 — Stay support B102—23101; 8 — Chain B102—23204; 9 — Pin B102—23207; 10 — Key B102—23203; 11 — Spring B102—23205; 12 — Latch B102—23208; 13 — Lock B102—23206

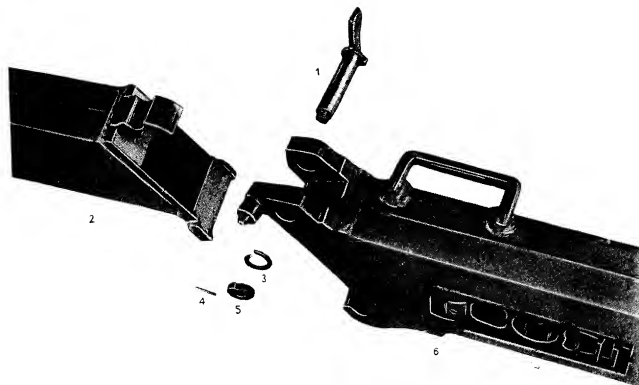


Fig. 65 — FRONT AND REAR CARRIAGE TRAIL CONNECTING BOLT — DIS-

MANTLED

1 — Connecting bolt B102—24105; 2 — Trail B102—24400; 3 — Washer B102—24104; 4 — Pin B102—24101; 5 — Nut B102—24103; 6 — Trail B102—24204

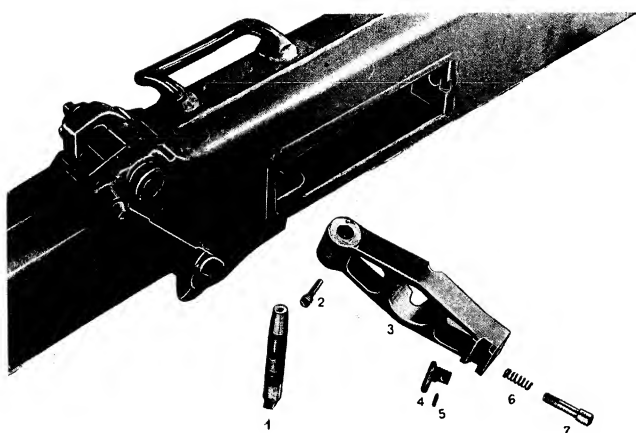


Fig. 66 — CARRIAGE TRAILS CONNECTOR — DISMANTLED

1 — Shaft B102-24206; 2 — Screw B102-24210; 3 — Connector B102-24208; 4 — Head B102-24202; 5 — Pin B102-24201; 6 — Spring B102-24205; 7 — Lock bolt B102-24203

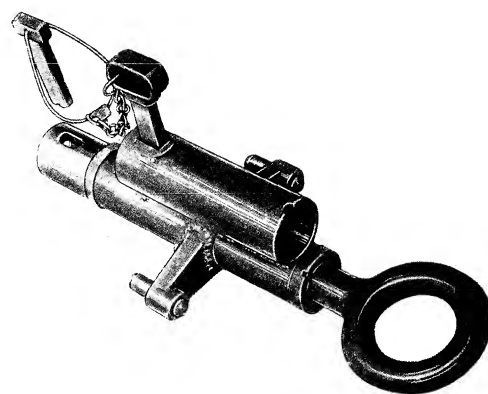


Fig. 67 — LUNETTE — GENERAL VIEW

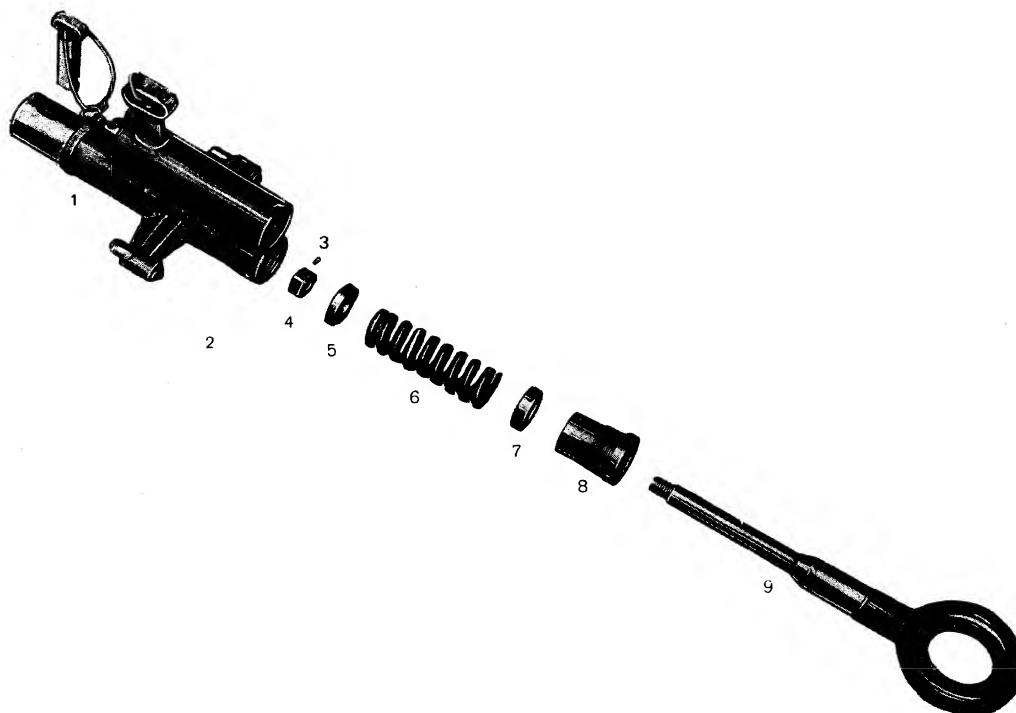


Fig. 68 — LUNETTE — DISMANTLED

1 — Lunette casing B102—25008; 2 — Screw B102—25016; 3 — Screw B102—25015; 4 — Nut B102—25007; 5 — Ring B102—25013; 6 — Spring B102—25010; 7 — Ring B102—25012; 8 — Nut B102—25006; 9 — Lunette B102—25009

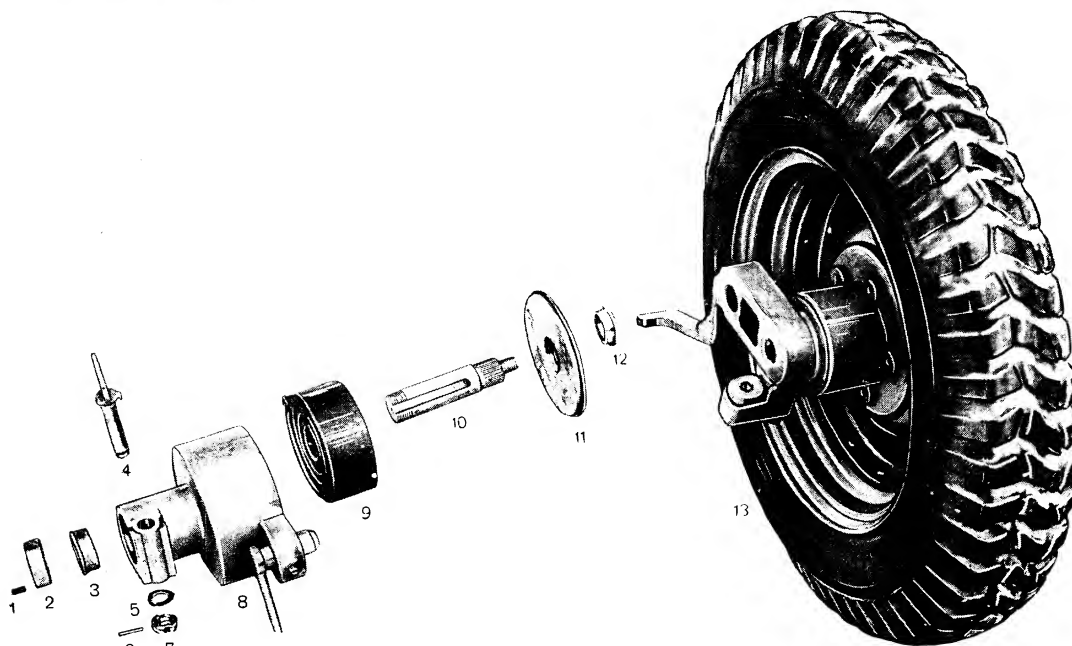


Fig. 69 — SPRING DEVICE WITH COIL SPRING — DISMANTLED (for weapons B1 and B1A1)

1 — Screw B103—26017; 2 — Nut B103—26007; 3 — Bearing bushing B103—26006; 4 — Fastening bolt B103—27003; 5 — Washer B103—26014; 6 — Pin B103—26001; 7 — Nut B103—26009; 8 — Casing B103—27002; 9 — Coil spring B103—26010; 10 — Shaft B103—26012; 11 — Cover B103—26015; 12 — Bearing bushing B103—26005; 13 — Wheel B103—31000

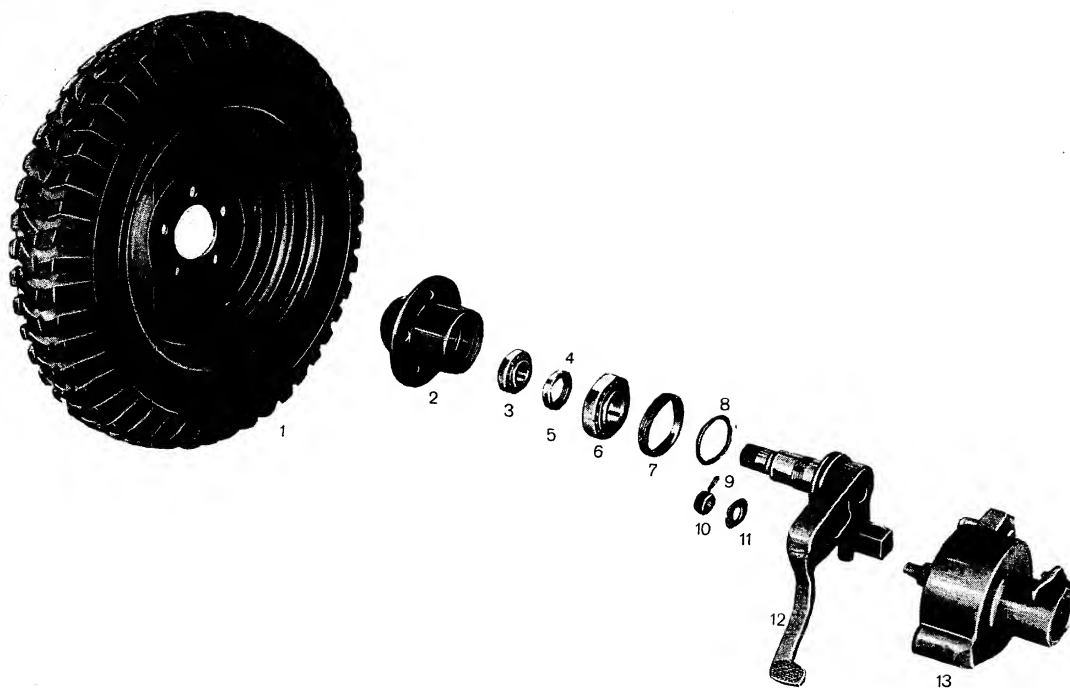


Fig. 70 — WHEEL WITH PNEUMATIC TYRE — DISMANTLED (for weapons B1 and B1A1)

1 — Wheel; 2 — Hub B103—30004; 3 — Roller bearing B103—30023; 4 — Ring nut B103—30015; 5 — Screw B103—30020; 6 — Roller bearing B103—30024; 7 — Ring B103—30014; 8 — Wiper B103—30002; 9 — Cotter pin B103—26020; 10 — Nut B103—26008; 11 — Washer B103—26013; 12 — Semi-axle B103—30013; 13 — Spring device B103—27000

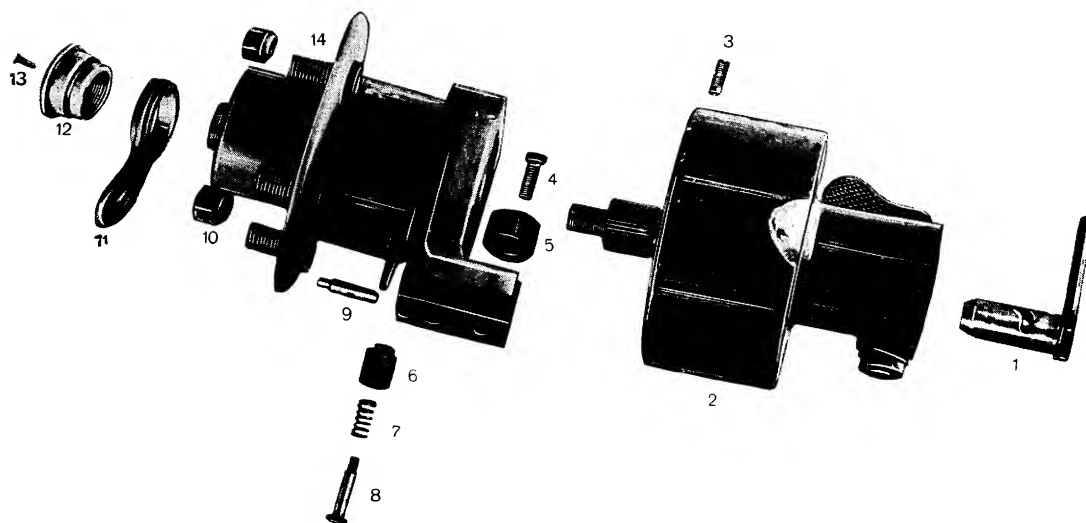


Fig. 71 — SPRING DEVICE WITH COIL SPRING — DISMANTLED

1 — Bolt B103—27001; 2 — Spring device B103—27000; 3 — Screw B103—26018; 4 — Screw B103—30022; 5 — Buffer B103—30009; 6 — Handgrip B103—30016; 7 — Spring B103—30011; 8 — Screw B103—30021; 9 — Blocking bolt B103—30007; 10 — Nut B103—30008; 11 — Eye B103—30010; 12 — Cover B103—30012; 13 — Screw B103—30019; 14 — Bolt B103—30017

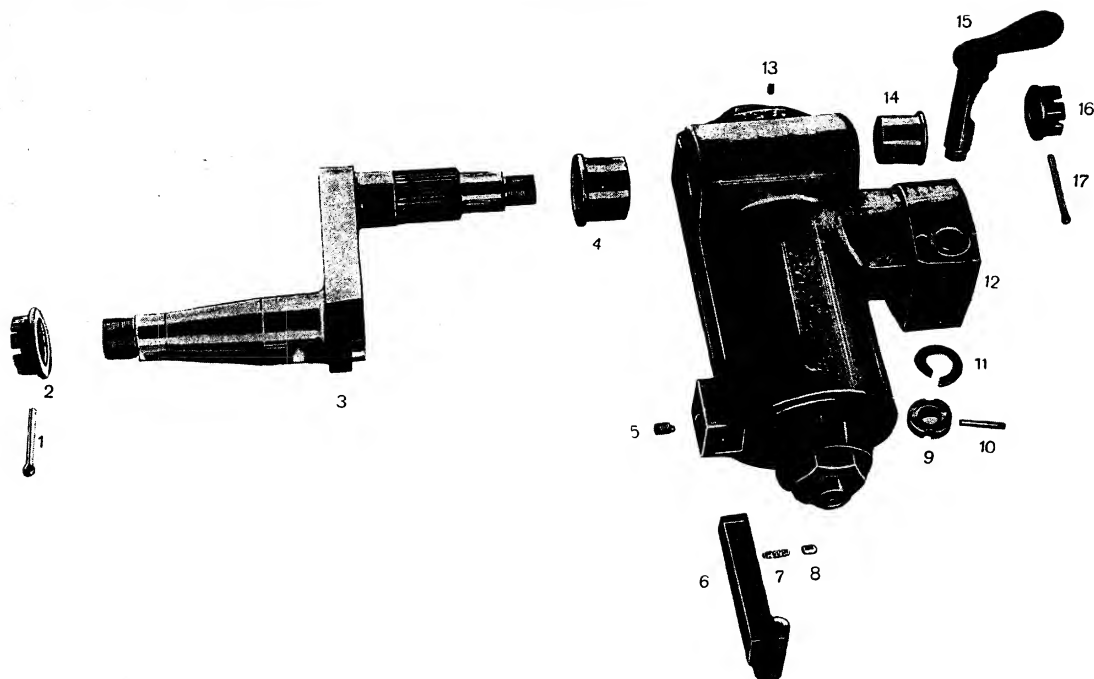


Fig. 72 — SPRING DEVICE WITH HELICAL SPRING — DISMANTLED (for weapons B1A2, B1A3 and B1A4)
 1 — Cotter pin B416—15207; 2 — Nut B416—15202; 3 — Semi-axle B104—28021; 4 — Bearing bushing B104—28009; 5 — Screw B104—28026; 6 — Key B104—28004; 7 — Spring B104—28015; 8 — Latch B104—28027; 9 — Nut B104—28012; 10 — Pin B104—28003; 11 — Washer B104—28018; 12 — Spring device B104—28000; 13 — Screw B104—28025; 14 — Bearing bushing B104—28008; 15 — Fastening bolt B104—28023; 16 — Nut B104—28011; 17 — Cotter pin B104—28028

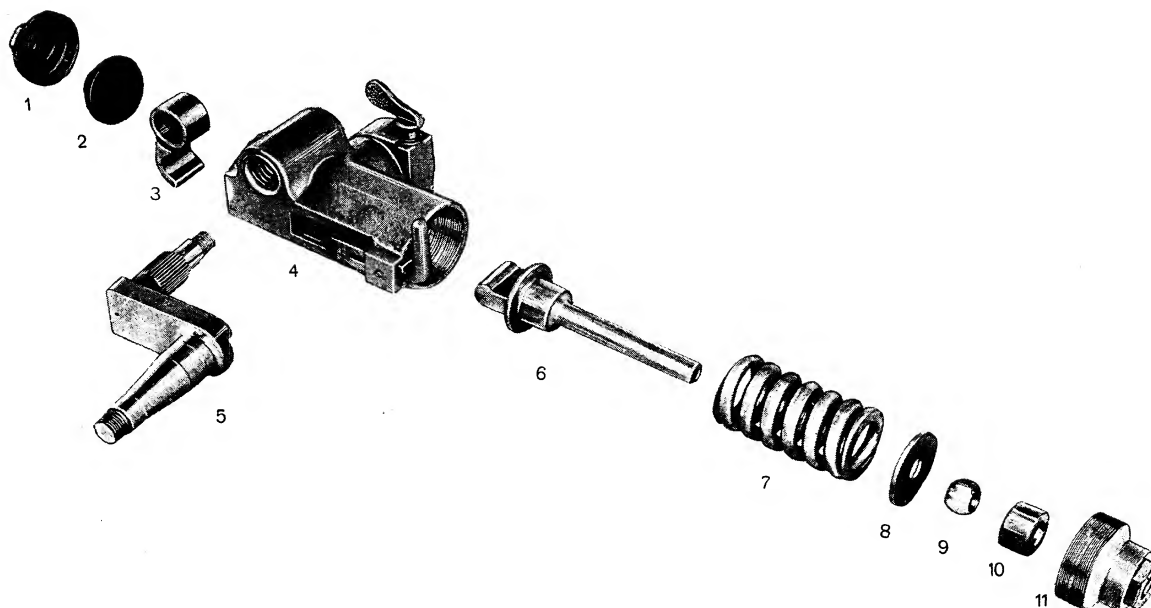


Fig. 73 — SPRING DEVICE WITH HELICAL SPRING — DISMANTLED (for weapons B1A2, B1A3 and B1A4)

1 — Cover B102—28019; 2 — Buffer B104—28013; 3 — Lever B104—28020; 4 — Casing B104—28006; 5 — Semi-axle B104—28021; 6 — Spindle B102—28024; 7 — Spring B104—28014; 8 — Washer B104—28016; 9 — Bearing B104—28007; 10 — Bushing seating B104—28005; 11 — Nut B104—28010

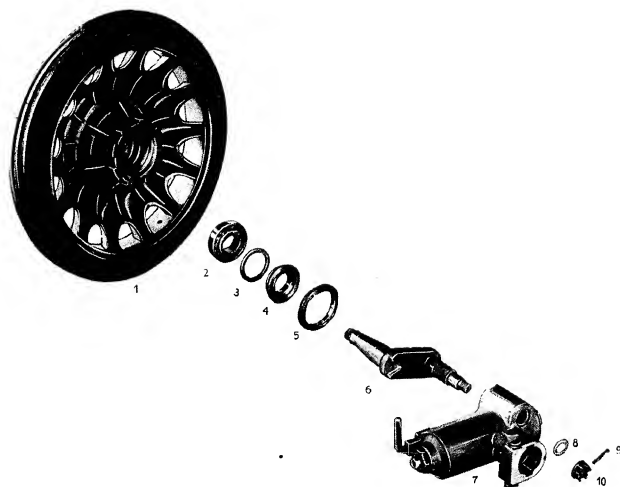


Fig. 74 — WHEEL WITH SEMI-ELASTIC TIRE AND SPRING DEVICE — DISMANTLED
1 — Wheel B416-15108; 2 — Roller bearing B103-30024; 3 — Wiper B104-28002; 4 — Ring B104-28022; 5 — Ring B416-15107; 6 — Semi-axle B104-28021; 7 — Spring device B104-28000; 8 — Washer B104-28017; 9 — Cotter pin B104-28028; 10 — Nut B104-28011

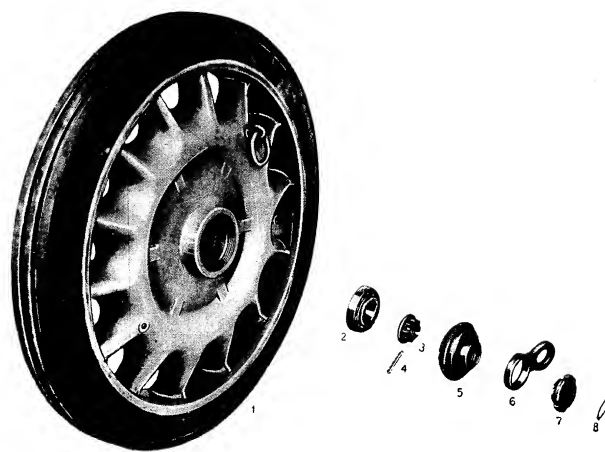


Fig. 75 — WHEEL WITH SEMI-ELASTIC TIRE — DISMANTLED
1 — Wheel B416-15108; 2 — Roller bearing B103-30023; 3 — Nut B416-15202; 4 — Cotter pin B416-15207; 5 — Cover B416-15106; 6 — Eye B416-15104; 7 — Nut B416-15103; 8 — Wire lock B416-15105

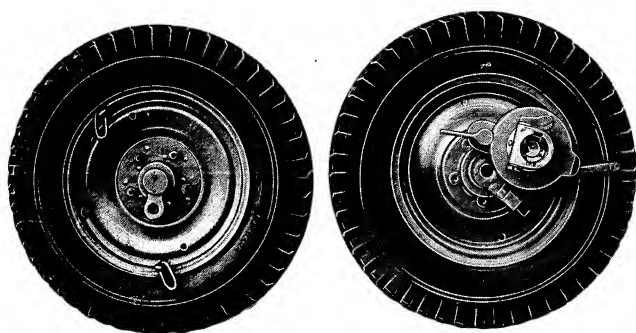


Fig. 76 — WHEEL WITH SPRING DEVICE FOR WEAPONS B1 and B1A1 — GENERAL VIEW

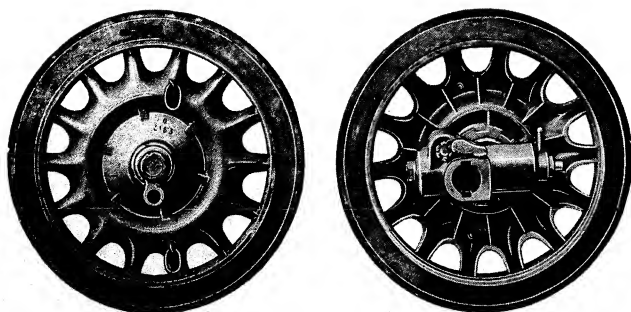


Fig. 77 — WHEEL WITH SPRING DEVICE FOR WEAPONS B1A2 and B1A3 — GENERAL VIEW

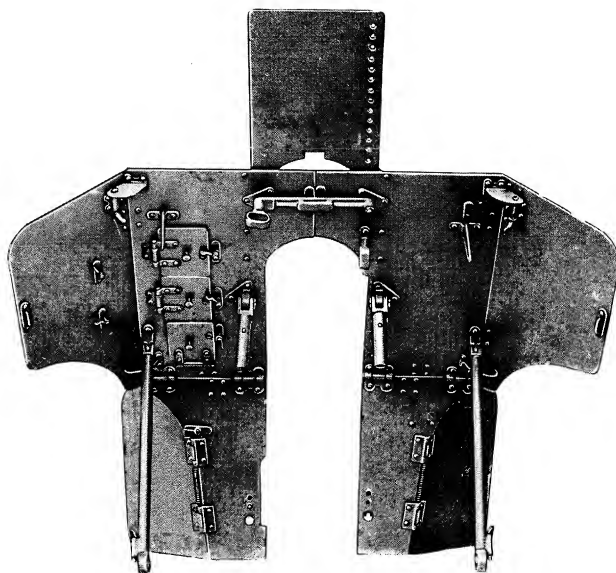


Fig. 78 — SHIELD — GENERAL VIEW

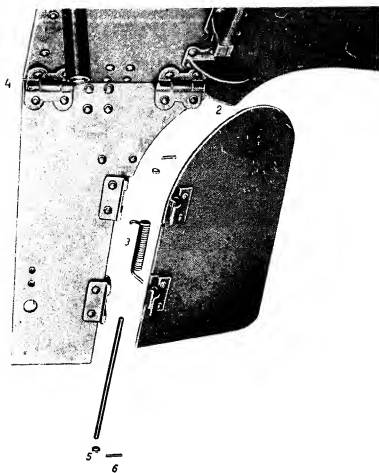


Fig. 79 — SHIELD LOWER WING

1 — Shield body B102-34110; 2 — Shield wing B102-34103; 3 — Spring B102-34104; 4 — Shaft B102-34106; 5 — Washer B102-34107; 6 — Cotter pin B102-34108



Fig. 80 — STEEL BOTTLE FOR NITROGEN UNDER PRESSURE — GENERAL VIEW

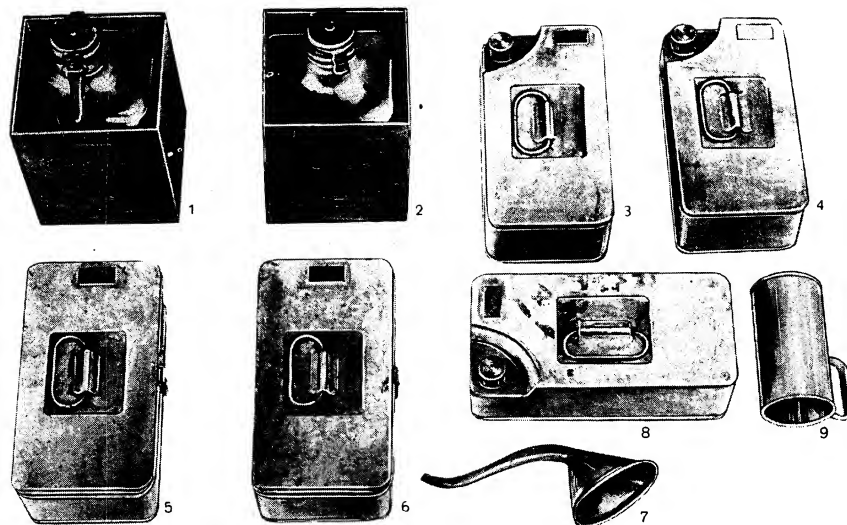


Fig. 81 — GUN ACCESSORIES

1 — And 2 — Glass bottle B102-3600 and box B102-41800; 3 — Can for diesel fuel B102-41000; 4 — Can for askerol B102-41100; 5 — Container B102-41500; 6 — Container B102-41600; 7 — Funnel B102-41900; 8 — Can for gun oil B102-41200; 9 — Vessel B102-41950

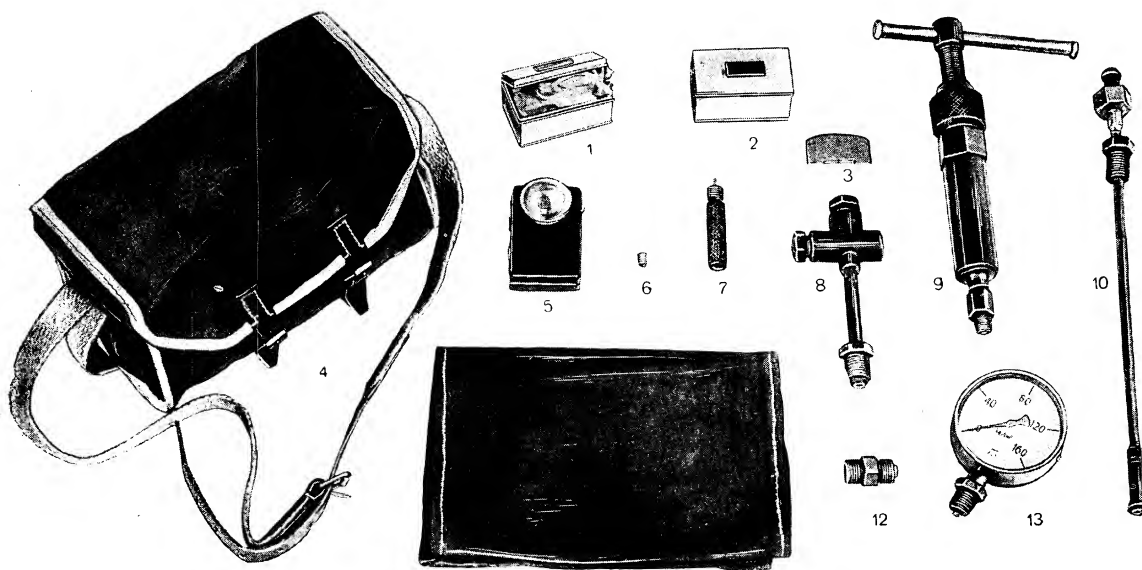


Fig. 82 — GUN ACCESSORIES

1 and 2 — Box for wadding and chamois leather; 3 — Gauge B102-44000; 4 — Tool bag B102-48600; 5 — Pocket lamp B102-46000; 6 — Bulb B102-46002; 7 — Valve compressor B102-37100; 8 — Three way tap B102-53000; 9 — Pump B102-51060; 10 — Copper tube B102-37000; 11 — Canvas B102-48400; 12 — Tube fitting B102-37200; 13 — Pressure gauge B102-47000

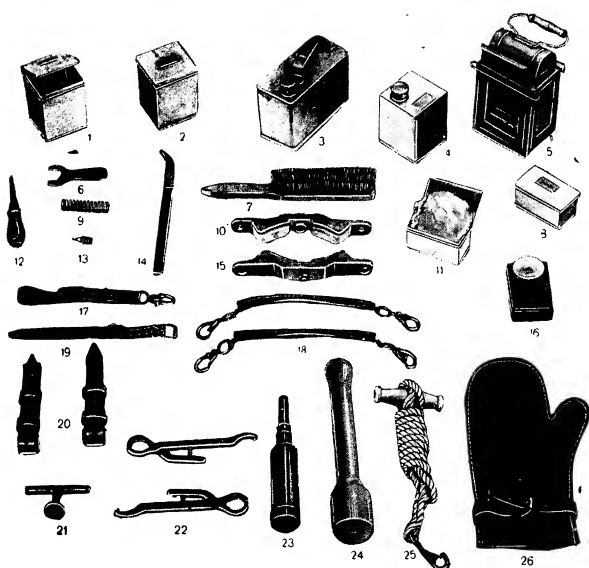


Fig. 83 — GUN ACCESSORIES

1 — Container B102-41300; 2 — Container B102-53200; 3 — Can B416-33100; 4 — Can B416-53000; 5 — Artillery lantern B416-52000; 6 — Wrench B102-79004; 7 — Brush B102-38500; 8 — Container B102-41400; 9 — Spring B102-14102; 10 — Bearing B102-56100; 11 — Wadding and cloth with container; 12 — Screwdriver; 13 — Firing pin B102-14101; 14 — Hand extractor B102-40000; 15 — Barrel bearing B102-56200; 16 — Pocket lamp B102-46000; 17 — Strap B416-62400; 18 — Steel rope B416-58000; 19 — Strap B416-62600; 20 — Strap B102-56000; 21 — Wrench B102-42000; 22 — Wrench B102-42100; 23 — Grease gun B416-59000; 24 — Compressor B102-46500; 25 — Lanyard B102-37300; 26 — Gloves B102-48500

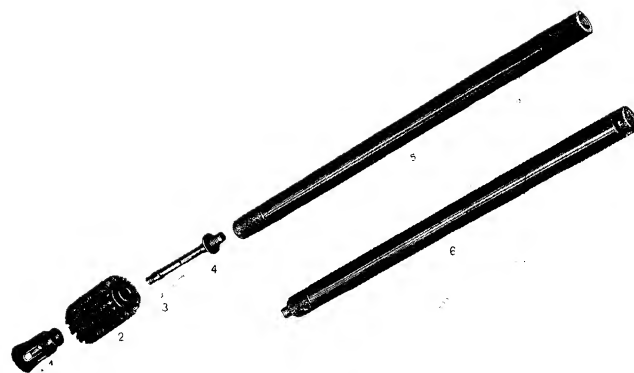


Fig. 84 — BARREL CLEANER WITH CARTRIDGE DRIVER — DISMANTLED

1 — Driver B102-39006; 2 — Brush B102-39003; 3 — Screw B102-39009; 4 — Shaft B102-39007; 5 — Stick B102-39004; 6 — Stick B102-39005

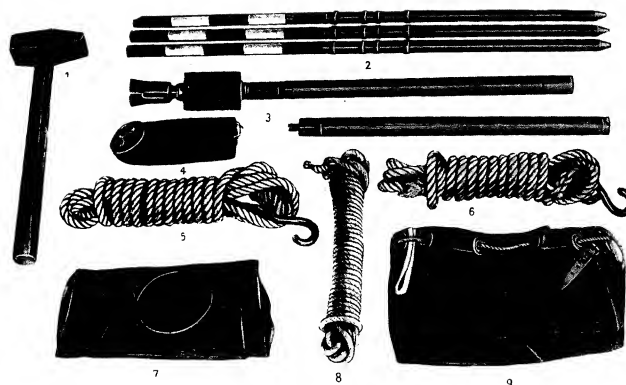


Fig. 85 — GUN ACCESSORIES

1 — Hammer B102—35000; 2 — Lever B102—50000; 3 — Barrel cleaner B102—35000; 4 — Cover B102—48000; 5 — Towing rope B416—54000; 6 — Towing rope B416—54000; 7 — Cover B102—48200; 8 — Lanyard B416—57000; 9 — Cover B102—48300



Fig. 86 — BOX WITH WEAPON PARTS SET — GENERAL VIEW

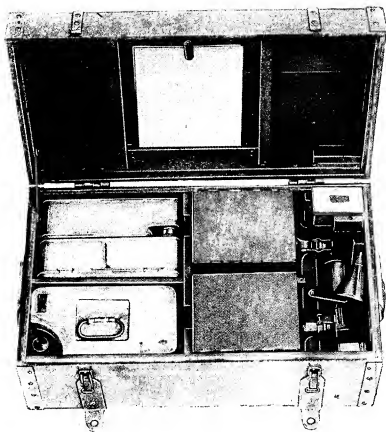


Fig. 87 — BOX WITH BATTERY PARTS SET No 1 — GENERAL VIEW

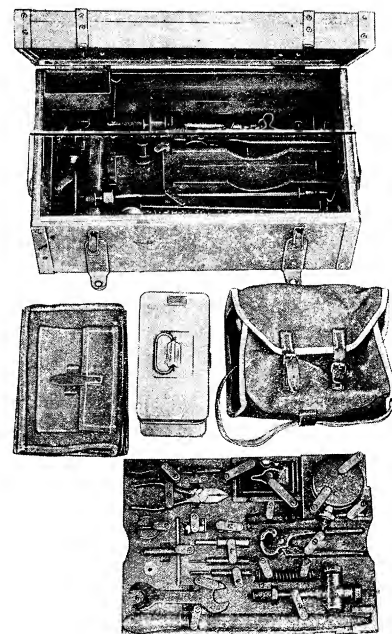


Fig. 88 — BOX WITH BATTERY PARTS SET No 2 — GENERAL VIEW

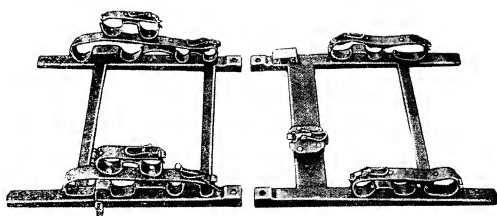


Fig. 89 - FRAME FOR CARRYING PIONEER TOOLS - LEFT AND RIGHT
- GENERAL VIEW

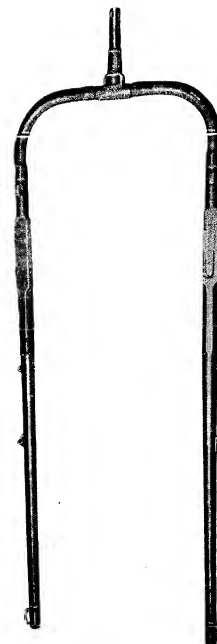


Fig. 90 - THILL FOR TANDEM TOWING - GENERAL VIEW

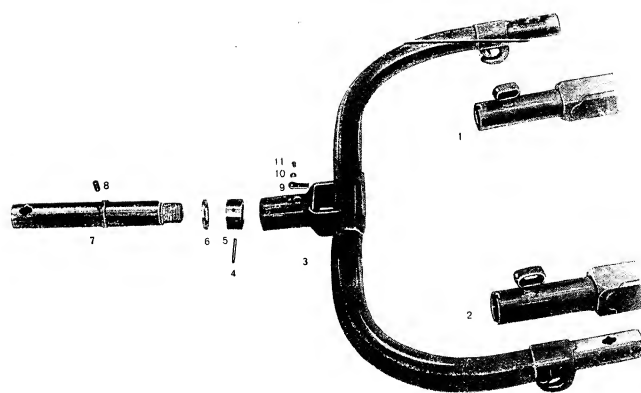


Fig. 91 - THILL FORK - DISMANTLED

1 - Thill B416-66300; 2 - Thill B416-66200; 3 - Fork B416-66108;
4 - Pin B416-66102; 5 - Nut B416-66103; 6 - Washer B416-66105;
7 - Shaft B416-66104; 8 - Screw B416-66100; 9 - Cover B416-
66107; 10 - Washer B416-66106; 11 - Screw B416-66110

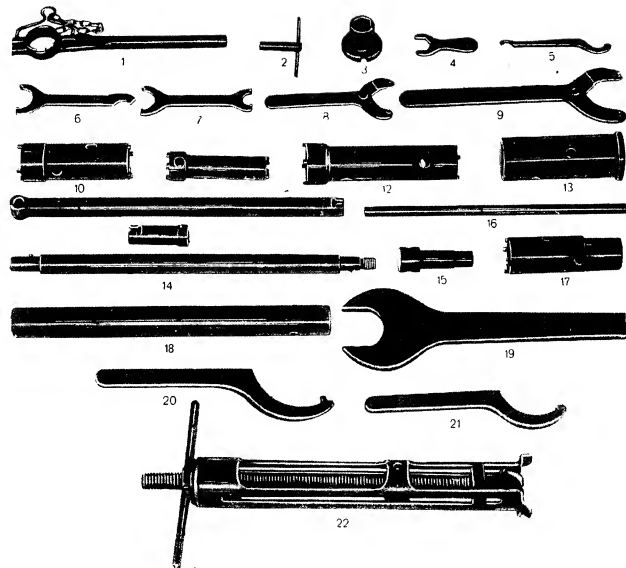


Fig. 92 - SPECIAL TOOLS

1 - Wrench B102-59002; 2 - Wrench B102-59003; 3 - Bushing
B102-59001; 4 - Wrench B102-59004; 5 - Wrench B102-59005;
6 - Wrench B102-59006; 7 - Wrench B102-59007; 8 - Wrench
B102-59008; 9 - Wrench B102-59009; 10 - Wrench B102-59010;
11 - Wrench B102-59011; 12 - Wrench B102-59012; 13 - Wrench
B102-59013; 14 - Wrench B102-59014; 15 - Wrench B102-59015;
16 - Lever B102-59022; 17 - Wrench B102-59016; 18 - Wrench
B102-59017; 19 - Wrench B102-59021; 20 - Wrench B102-59020;
21 - Wrench B102-59012; 22 - Fixture for equilibrator assembling
and dismantling B102-60000

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THE DIFFERENCES BETWEEN MODELS

The differences between individual models of this weapon are in the following:

1. The 76 mm mountain gun M-48 B-1

- The weapon is equipped with pneumatic tyres and with spring devices having spiral springs.
- The weapon is suitable for motor vehicle tow transportation with maximum speeds up to 60 km/h and on poor roads and off roads at speed permitted for the motor vehicle and also for tandem tow and by loading on pack-saddles. For all methods of transportation the necessary accessories are provided in spares, tools and accessories sets of the weapon.
- The face of the breechblock is provided with a built-in backplate which is attached with screws.
- The hydraulic recoil brake and the recuperator are filled with compressed air and hydraulic fluid „STEOL MJ". The ring shaped rubber jointing of the floating piston in the middle cylinder is coated with leather.

Remark: As an improvement of this model the following changes have been made: instead of compressed air, the use of compressed azote has been introduced, instead of hydraulic fluid „Steol MJ", the use of hydraulic fluid „STEOL MM" has been introduced and the ring shaped rubber jointing of the floating piston is not being coated with leather. The weapons on which these improvements are not yet introduced, should be sent to the appropriate workshops for reconditioning.

2. The 76 mm mountain gun M-48 B-1A2

- The weapon is equipped with wheels made of light alloy with solid semi-elastic tyres and instead of spring devices with spiral spring; this model is provided with a cylindrical coil spring.
- In consideration of the wheel design the weapon is adapted for transportation at a speed of 30 km/h on good roads and depending on the quality of the road it should be reduced as required.
- The weapon is suitable for transportation in tandem tow and on pack-saddles. For this purpose it is provided with necessary accessories in the weapon set of spares, tools and accessories.
- The breechblock face is not provided with a separate built-in backplate.
- The hydraulic recoil brake and the recuperator are being filled similarly to the model 76 mm M-48 B-1 and it is necessary to introduce all improvements indicated under „The 76 mm mountain gun M-48 B-1".

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- This model is furnished with the weapon set of spares, tools and accessories which varies from the set for model B-1 owing to the differences in wheels and spring devices. The weapons may be furnished with universal set of spares, tools and accessories which is adequate for both B-1 and B-1A2 models.

The design changes on this model are made for the purpose of:

- greater durability of the spring device,
- eliminating the sensitivity of pneumatic tyres on mechanical injuries during transportation and against bullets and artillery shell fragments,
- reducing the pack weight of the wheel with the spring device for 20 kg during mountain transport on pack-saddles,
- reducing the pressure on the thill animal in tandem tow for 10 kg.

3. The 76 mm mountain gun M-48 B-1A1-1

- The weapon is equipped with pneumatic wheels same as for model B-1, with the exception that the hub interior is same as on the wheel with the solid tyre B-1A2, making the removal of the wheel from the axle simple.

- The spring device with the cylindrical coil spring is the same as on model B-1A2 and in assembly with pneumatic tyres enables travelling speed of 60 km/h on good roads and off roads the speed allowed for the motor vehicle.

- This model is not adapted for transportation on pack-saddles, because the weapon set of spares, tools and accessories is not furnished with the necessary accessories for loading on pack-saddles. All other necessary elements for pack-animal loading are attached on the weapon.

- The weapon is not suitable for tandem towing, because the lunette is not provided with a special seating for the thill fork. Only models B-1 and B-1A2 are provided with this seating.

- The hydraulic recoil brake and the recuperator are filled with azote and hydraulic fluid „STEOL MM'' and all jointings are made of rubber without the leather coat on the ring shaped jointing of the floating piston.

- The sear on its upper surface is different from the sears of models B-1 and B-1A2.

- The breechblock face is not provided with a separate built-in backplate as on the model B-1.

INTRODUCTION

This instruction book includes the rules for maintenance and repair of the Mountain Gun 76 mm M-48 B-1 and B-1 A-2 and B-1A-1-1 in workshops on short scale basis. The repairs herein described are not being executed in unit shops up to the regimental workshop.

This instruction book describes the procedures which should be applied prior to starting of repairs; instructions are given for repairing of the most important assemblies only and the characteristic repairs of the gun which may often arise are enumerated.

This manual contains the repairing method for the:

- Barrel
- Breechblock with the semi-automatic mechanism
- Recoil mechanism and recuperator
- Traversing and elevating mechanism
- Repairing and adjustment of equilibrators
- Other characteristic repairs.

Aside the procedures for repairing, also the chronological order for disassembling and assembling of more complicated assemblies is given.

Other procedures to be followed are described in the instruction book „Mountain Gun 76 mm M-48 B-1“ and in its Annex I.

This instruction book does not describe repairing procedures in individual grades of workshops but repair of assemblies and parts regardless of where the repairs are being carried out.

Prior to every repair a general inspection is made to determine the degree of defects and the condition of the weapon in general.

INSPECTION OF THE WEAPON PRIOR TO REPAIR

The weapon, spare parts, tools and accessories should be inspected by the expert personnel of the workshop prior to repairing, during repairing and after completion of repairing.

The inspection of the weapon should be made in completely clean and free from lubricant state. Before starting inspection it is obligatory to make sure the barrel of the gun is empty.

The inspection of the weapon is carried out first in its assembled state and then in disassembled state. The purpose of the inspection is to determine the general state of the weapon, to find the defect or the damage in the assembly or in the equipment and then the damaged part, and finally to determine the most probable cause for the defect. At the same time also the extent of the

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defect, the scope and manner of repairing and the parts and materials required for repairing, should be determined.

Prior to inspection the gun book should be checked to see whether all particulars about the gun are entered, whether the book is properly kept and whether the data entered in the book agrees with the actual condition of the weapon. When necessary, additional data should be entered to bring the gun book up to date.

During the inspection the following should be determined:

- whether the weapon had been cleaned from grease, superfluous or gritted oil, contamination and other matter which may hinder the proper functioning or hide the actual state of individual parts,
- when more than one weapon is undergoing repairs at the same time, the part numbers of individual weapons should be recorded,
- general condition, appearance of the weapon, the state of loose and broken parts,
- whether all repairs had been carried out on the weapon for the purpose of improving it,
- whether the lubricating cups are marked with red colour and whether the sliding surfaces, hinges, connections and other parts are clean and free from rust or foreign matter,
- whether the instruction plates are in order,
- whether the operating devices work easily and whether there are plays in them,
- whether there are cracks or breaks on parts, especially on cast and welded parts,
- whether the painting is damaged or whether the paint has fallen off the parts,
- whether spares, tools and accessories set is complete and in good order and whether they need repairing,
- whether firing or artificial recoiling was performed with the piece for the purpose of checking the functioning of the hydraulic recoil brake.

INSPECTION OF THE WEAPON DURING REPAIRS

These examination of the weapon are performed by expert personnel in the workshop in conformance with this instruction manual.

The purpose of these examinations are to follow constantly the quality and the exactness of work being done, to check whether the repairing is being done in the approved manner, and to find and remedy the defects which were missed during the inspection prior to repairs.

THE FINAL INSPECTION AND CONTROL AFTER REPAIRS

After completion of repairs performed on the weapon and its parts, a careful control should be carried out by the authorized Organ.

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The condition found during this control be entered into the corresponding documents.

THE GENERAL REPAIRS AND MAINTENANCE PROCEDURE

Disassembling of the piece is performed by removing the main assemblies, and then these assemblies are stripped down to their component parts. The assembling is performed by reversing the procedure.

It is not always necessary to perform complete disassembling of the piece in order to repair or replace of individual parts. It should be done only to the extent necessary. In order to reduce the disassembling to the necessary measure, prior to remedying the defects, the damaged assembly should be discovered first and then the damaged part and the most probable cause for the damage. Only then may the repairing be started.

Replacement of wornout parts is being generally performed during repairs. The parts usually replaced then are: bronze bushings, cotter pins, damaged screws and nuts. Also the weakened or broken springs should be replaced.

If new part for replacement is not available the old one should be repaired but it is necessary to test carefully such a part to determine its functioning worth.

Scratches and worn bearings should be remedied. If some bearings are bored or grooved for lubrication, prior to assembling they should be checked to make sure they are clean. Special care should be given in setting the bearings having lubricating holes; the holes should coincide. Great care should be given in setting the bearings to avoid damaging or bending.

Spacing and plays between the bearings and the shaft should be such as to enable proper fitting and functioning of the shaft. It is not recommended to scrape, polish or to broaden narrow holes with a reamer on bearings provided with lubricating cups. If using a reamer cannot be avoided to broaden the hole, it should be done after the bearing has been set. After completion of broadening of the hole, the metal shavings should be carefully cleaned.

Cleaning of disassembled parts should be done immediately on removing them followed by applying a thin layer of corresponding grease. This would prevent rusting of part during the time they are disassembled.

Bearings require special care in cleaning and lubricating. When the dirt or grease is removed off the surface, the bearings should be put in hot oil and in grease. Following this the bearings should be cleaned, greased and wrapped in oiled or waxed fabric or paper and kept so until assembling or until completion of inspection of parts.

Removal of old paint or rust with a sand compressor is permitted off non-working surfaces only.

It is strictly forbidden to wash assemblies with a water jet and steam under pressure especially after inspection or repairs.

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THE GUN LOG BOOK

The gun log book is used for entering correct data concerning the condition of the weapon and the book should be kept by the weapon always. The loss of the gun book should be reported to the responsible technical service organs; the report should contain all available data about the weapon and its history for the purpose of using it when issuing the new gun log book. The records should be entered in the gun log book regularly and efficiently as to enable proper maintenance of the weapon and the accessories and in order to avoid duplications of repairs and servicing (control or change of fluid), special attention should be given to the following:

a) Enter the data about the executed order for replacement if this data was not entered. This data should show the date of execution and bear the signature of the responsible organ for the execution of the replacements.

b) Enter the data about changing the lubricant and the fluid in the hydraulic brake in order to prevent double lubrication and to acquaint the person doing the inspection with this state.

c) Enter the particulars about the number of rounds fired and the particulars concerning the bore gauging. The barrel bore caliber should be measured after every thousand rounds fired. In the event that by an error in the unit a round is fired with a greater charge than the maximum allowed charge, gauging of the bore and inspection should be carried out prior to further exploitation of the weapon.

The estimated life of the barrel of this weapon is approximately 12,000 rounds.

Prior to inspection of weapons a check should be made to see whether all particulars are entered in the gun log books, which must be posted according to the rules and orders for keeping gun log books. A check should be made whether the books are properly kept and whether the entries in the book agree with the actual state of the weapon. In case of disconformity between the data in the gun log book with the state of the weapon, the gun log book should be corrected.

A. THE BARREL REPAIR

By barrels, defects which may be eliminated by repairs or defects owing to which the barrel must be replaced a new one, may be encountered. The bore of the barrel should be inspected by using the lighting equipment as shown in figure 1, and if no lighting equipment is available a pocket battery lamp may be used for illuminating the barrel bore. The lamp with the mirror should be set tilted and by changing the position of lamp and the mirror directing the light rays on the spots in the bore which are being inspected. During inspection the barrel should be absolutely clean.

In the interior of the barrel should be no dirt, sand, rust and the lands must not be deformed. The grooves should be checked to make sure that there are no scratches and corrosion. In the barrel there must not be powder soot. Copperish barrels should not be mistaken for powder soot. A clean barrel must not always be shiny and after it may have the appearance of dark grey colour. It is prohibited to polish the barrel.

The centering slope should be inspected to see that it is not damaged. Scratches, rust, corroded places, charred spots, etc. in the bore of barrel enable the gases to leak along the rotating band of the projectile and cause erosion of the centering slope.

The grooves should be inspected at the muzzle to see that there are no chipped lands and melted metal in them. Cutting or plucking of lands may happen especially at places where the grooves begin.

When keeping the weapons in storage or for long lasting transports, the bore of the barrel should be well greased.

During each repair of the weapon, the bore of the barrel should be gauged. Prior to gauging the bore must be absolutely clean, and in the event that serious copper layers are noticed in the bore, then prior to gauging the measures for removing the copper from the bore should be taken following the decopperization instructions given in this manual.

For gauging, the barrel should be brought in horizontal position, and the gauging ought to be done at every 5 cm of the bore length in two cross positions under 90°. It is necessary to gauge the dimensions of both grooves and lands.

The barrel bore gauging results should be entered in the gun log book.

The ballistic life of the barrel is approximately 12,000 rounds.

The gauging of the barrel bore should be made after every 1000 rounds fired, regardless whether there is need for repairs.

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DEFECTS ON THE BARREL

By barrel: following defects may be encountered:

a) Owing to which the barrel must be replaced:

- swelling of the barrel
- cracking of the barrel
- great charring of the barrel
- taken off lands

b) Defects that may be repaired:

- exterior injuries of the barrel
- breakage of links

Exterior injuries of the barrel - When dents are noticed on the barrel, they should be eliminated by scraping and polishing the injured place. After eliminating of the injury, check whether the assembling can be easily performed. Special attention should be given to injuries on the barrel face, the plugs for guiding the barrel in the mantle and the interrupted threads for connecting the barrel with the breechring.

Breakage of links - The broken carrying links should be replaced with new ones made according to figures 2 and 3. After attaching, the rotating of the links on the swivel should be checked. To check the rear link, the barrel, mantle and the breechring should be assembled. If necessary the link should be adjusted.

B - BREECHBLOCK AND SEMI-AUTOMATIC MECHANISM REPAIR

By the first set of B-1 Gun the breechblock is provided with a striker plate fixed on the breechblock face with screws. The breechblock on the later models is made without this striker plate.

a) DISASSEMBLING OF THE BREECHBLOCK

To disassemble the breechblock proceed as follows:

- pull the trigger
- remove the back plate
- remove the striker spring
- remove the striker by lifting the trigger upward and by turning the re-cocking handle in order that the striker may leave its seating easier,
- release the connection of the breechring with piston rods and pull back the barrel so much that the semiautomatic shaft passes the cam,
- remove the cotter pin from the parts driving shaft,
- unscrew the shaft nut,
- lift up the semi-automatic circular box assembly,
- remove the pin connecting the shaft and the circular box,
- remove from underneath the driving parts shaft,
- press down the pusher dent and pull out the extractor shaft,
- remove the extractor shaft safety element by pressing on the pusher dent and removing the stop and the spring,
- pull out the breechblock body halfway,
- remove the breechblock body guide,
- remove the extractors,
- remove the sear,
- turn the breechblock body so that the trigger dent may freely leave its seating,
- press the trigger dent through the opening for the sear, pull out the trigger shaft and the trigger dent with the spring,
- remove the re-cocking handle from the breechring by pulling the handgrip upward, turning the handle to the left and to the extreme rear position and lifting the handle upward,
- remove the semi-automatic mechanism retainer with the spring from the breechring.

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b) DISASSEMBLING THE SEMI - AUTOMATIC MECHANISM

To disassemble the semi-automatic mechanism proceed as follows:

- place the lever with the circular box and the opening spring on its seating in breechring,
- embrace the two projections on the cover with the wrench and turn to the left until the cover dent is detached from the box,
- lift the cover only so much to detach it from the box and with the key release the opening spring slowly,
- when the spring is fully released lift up the cover,
- remove the opening spring and the inner connector.

To detach the closing spring, proceed as follows:

- place the semi-automatic mechanism spring casing in the vice,
- turn the shaft to the left until the casing dent detaches from the shaft dent,
- remove the shaft and take out the spring from the casing.

To remove the lever lock, proceed as follows:

- take out the cotter pin from the shaft,
- remove the small shaft, the handle and the handle spring.

To remove the barrel fastener and the breechring, proceed as follows:

- drive out the pin from the bottom side of the shaft,
- pull the shaft out,
- detach the fastener and remove the spring.

c) ASSEMBLING OF THE BREECHBLOCK

To assemble the breechblock, proceed as follows:

- attach the barrel fastener with the breechring and fix the spring,
- attach the shaft and secure with the pin,
- place the semi-automatic mechanism retainer with the spring in its seating in the breechring,
- place the re-cocking handle in its seating on the breechring,
- take the breechblock body, press the trigger dent into the seating and place the trigger shaft into the breechblock body,
- fix the sear in its place,
- set the breechblock body halfway into the breechring,
- fix the operating parts guide in its place,
- attach the extractors and the extractors' shaft,
- attach the operating parts shaft with the inner connector lock bolt,
- close the breechblock completely,

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- attach the lever and the circular box,
- screw the nut on the operating shaft and fix it with the cotter pin,
- attach the striker, lift up the trigger so that the breechblock is in fired (not cocked) position,
- insert the striker spring,
- insert the back-plate,
- check the function of parts by opening and closing the breechblock, re-cocking and triggering.

d) ASSEMBLING THE SEMI-AUTOMATIC MECHANISM

To assemble the lever handle, proceed as follows:

- insert the handle spring, the handle, the small shaft and the cotter pin,

To assemble the circular box, proceed as follows:

- attach the circular box to the breechring,
- insert the inner connector with the opening spring,
- wind (compress) the spring by turning the inner connector to the left until the dent on the bottom side of the inner connector reaches the slot on the circular box,
- place the cover on the box and turn it with the key until the dent of the arc projection of the cover coincides with the recess on the circular box and then press down the cover,
- place the closing spring on the shaft and tighten simultaneously,
- put the bushing on and tighten the spring by turning the bushing until its dent connects with the dent on the shaft of the operating parts.

e) THE BREECHBLOCK PARTS REPAIR (FIGURES 4-28)

The following defects may appear in the breechblock:

- misfiring,
- self-firing,
- re-cocking impossibility,
- jamming of the breechblock body,
- wear and breakage of individual parts.

Misfiring - Misfiring may be caused by:

- superfluous grease or grease grit,
- weakened striker spring,
- defective firing pin point,
- worn out guide.

- If superfluous grease or grease grit is present in the striker seating it should be removed with a piece of wood or, if necessary, by submerging it into hot oil.

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- If the striker spring is shorter than 74 mm it should be replaced with a new one. If a spare spring is not available a new one should be made according to dimensions in figure 8. As a temporary measure a washer of maximum thickness 3 mm may be inserted in the striker hollowness before the spring.

The standard strength of the striker spring should be in the limits of 35 ± 1.5 by the maximum compression of the spring, and at inspection for repair must not be less than 30 kg.

After every replacement of the spring, firing and the function of the semi-automatic mechanism should be checked by means of artificial recoiling of the barrel.

- If the firing pin point is defective, due either to wear or breakage, it should be unscrewed from the striker and replaced with a spare firing pin. If a spare firing pin is not available, a new one should be made according to dimensions in figure 9.

The surfacial hardening of the firing pin point should be 0.5 mm deep and the hardness at least 45 Rc.

After adjustment of the firing pin the height of the point protrusion from the breechblock should be checked with a gauge from spare parts set. The firing pin point should protrude at least 2 mm.

- If the guide is too worn and does not press the breechblock body completely into its seating, then, due to then play in the breechblock, an eccentric hit of the firing pin into the primer may occur and cause misfire. If the play in the breechblock measures more than 0.40 mm, then it will be necessary to add a layer of material, by welding, on the portion of the guide which secures the position of the breechblock body when closed. Naturally the portion should be machined according to dimensions in figure 10 and the shapes checked with the template according to dimensions in figure 11.

After repairing of the guide the operation of the breechblock and the functioning of semi-automatic mechanism should be checked.

Self-firing - Self-firing may be caused by:

- worn trigger dent,
- too low position of the roller on the trigger.

If the trigger dent is worn out it should be replaced by a new one from the spares and spares are not available a new one should be made according to dimensions in figure 12. The wornout trigger dent may be repaired by welding on a piece as shown in the figure. Prior to machining the place where the piece is to be welded on, it should be annealed to make machining possible.

If the stop on the trigger gets too worn, then the position of the trigger roller is lower and it rests on the auxiliary trigger lifter. In this case when the breechblock is closed abruptly, the roller makes the trigger jump and thereby causing self-firing.

To remedy the self-firing due to the wornout stop, the old stop should be removed by boring it out and a new one inserted according to

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dimensions in figure 13. In case when the trigger is wornout also, then the trigger stop should be strengthened so that in assembled position the spacing between the roller and the lifter of the auxiliary trigger on the cam is at least 3 mm. In this case pay special attention so that trigger shaft does not draw downward the trigger dent; there should be certain play between the trigger shaft and the trigger dent.

Re-cocking impossibility - It will not be possible to perform re-cocking if:

- the spring of the re-cocking handle dent is broken,
- the re-cocking handle dent is wornout,

If the spring is broken it should be replaced with a new one made according to dimensions in figure 14.

If the dent is wornout a new one should be made according to dimensions in figure 15.

After replacement of the spring or making of a new dent, functioning of the re-cocking handle should be checked.

Jamming of the breechblock body - Jamming of the breechblock body is caused by:

- incorrect assembling of the breechblock parts,
- moving forward of the striker plate,
- breakage of breechblock parts.

Owing to incorrect assembling of parts and especially of the sear, jamming of the breechblock occurs. It is necessary to check whether all parts are correctly set. During freeing the breechblock body from the breechring, the re-cocking handle should be removed, as well as all other parts possible.

When jamming of the breechblock occurs it should be disassembled and its parts carefully inspected for damages.

Moving of the striker plate to the front occurs owing to loosening of set screws holding the striker plate. If the screws are loosened only they should be well tightened again because otherwise they may break and cause jamming of the breechblock. If the screws are broken new ones should be made according to dimensions in figure 16. After new ones are screwed in they should be centerpunched to secure them against turning.

If the plate starts moving forward while the breechblock is closed, the plate should be tapped back in its place with a wooden pole through the barrel. Prior to performing this operation it is recommended to take out the striker spring and the striker from breechblock body.

Notice:

Only by weapons from early series are there striker plates, now these are not being made anymore as separate pieces.

If jamming of the breechblock occurs owing to breakage of the sear, then in first places the striker spring and the striker should be taken out, and then through their seating the broken parts of the sear should be removed.

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Wear and breakage of parts - After longer use and operation of the breechblock wearing out as well as breaking of individual parts may occur and thereby causing incorrect functioning of the breechblock.

Breakage of the guide roller - If the roller should break a new one ought to be made according to dimensions figure 17. To remove the broken guide roller, the pin on the guide projection should be driven out and the screw holding the roller unscrewed. After setting the new roller, the screw should be screwed in so that it may be secured by a pin. Newly set roller should revolve freely when moved with a finger.

Wornout sear - When the sear dent wears out it should be firstly replaced with a spare one. If a spare dent is not available, a new one should be made according to dimensions in figure 18, and if case of emergency on the wornout place a layer of material should be welded on with electrode „Galeb 70“ and machined according to the pattern, in figure 19. Prior to welding the place of welding should be annealed. After final finishing the dent should be surfacially hardened to the depth of 0.5 mm and 50 Rc hardness.

The charred breechblock head - By breechblocks provided with a striker plate which is very much charred should be replaced from the spare parts set and if it is only slightly charred, so that the firing pin passage opening is still undamaged, then the plate should be re-ground and prior to assembling on the breechblock a ~~steel~~ washer of adequate thickness placed so that the surface of plate becomes flush with the breechblock head.

By breechblocks not provided with a striker plate, and if only slight charring occurred a layer of material should be welded on, the seating for passage of the firing pin should be made, with the tool according to dimensions in figure 20, and the front surface machined.

If charring greater than 0.5 mm occurred, then a seating 8.5 mm deep and 80 mm in diameter, should be made in the breechblock head for the striker plate which should be secured with screws according to dimensions in figure 16, adhering to the material prescribed.

When changing or mounting a new plate the play between breechblock head and the bushing should be checked and it ought to be at least from 0.1 to 0.3 mm.

Wornout striker - If the striker projection is wornout at the touching place with trigger dent or at the touching place with the sear, a layer of material should be welded on with electrode „Galeb 70“. Prior to welding the spots on which welding is to be performed should be annealed. After welding the striker should be machined so that the welded surfaces are within the dimensions in figure 21. After machining the welded projections should be surfacially hardened to the depth of 0.5 mm and 50 Rc hardness.

Wornout extractors - By extractors the wear may take place on the case extracting dent out the heel of the extractor and on the breechblock retainer dent. The wornout extractor dent for drawing out the case may be repaired by welding on electrode „Galeb 70“ and machining according to dimensions in figures 22 and 23. If the dent is badly wornout or broken, then a new one should be made following the

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procedure indicated in figures 22 and 23, depending whether the lower or the upper extractor is damaged.

If the wear, i. e. the bruised material is on heel of the extractor, the wornout places on the heel should be welded and machined according to dimensions in figures 22 and 23. The machined surfaces should be well polished.

If the extractor cracks along the length of the opening for the passage of the extractor shaft bolt, the extractor is not being repaired, but replaced with a spare extractor.

If pounding of material occurs on the dent for retaining the breechblock to such measure that retaining of the breechblock body is not sure, then a layer of material should be welded on with the electrode „Galeb 70” and machined to dimensions according to figure.

After every repair of the dent or the extractor heel it is obligatory to check efficiency of the semi-automatic extracting of the case. If the extracting efficiency is not up to the standard, the machined places should be rechecked and if necessary make readjustments or repeat the whole procedure.

Wornout breechblock handle dent - If the dent is only slightly worn it should be repaired by welding on a layer of electrode „Galeb 70” and machining and if it is seriously worn the dent should be removed, a new one made according to figure 24 and welded on the handle. After this the dent should be brought to dimensions shown in the figure.

Worn recess on the extractor shaft and on the extractor shaft lock - Due to mutual wear of these parts during operation of semi-automatic mechanism, the lock pin may fly out and the extractor shaft jump out of its seating.

The contacting surfaces should be checked and if necessary a layer of electrode „Galeb 70” welded on, followed by machining to dimensions shown in figures 25 and 26. After machining check the performed repairs by artificial recoiling of the barrel.

Bent trigger lock lug - This may occur due to shocks sustained during transport or some other similar case. To repair such defect the trigger should be removed and then the lock disassembled as follows:

- remove the pin
- take out the lock lug
- take out the lock shaft
- take out the lock spring.

If the shaft is only slightly bent it may be straightened by using a wooden or aluminium hammer without heating and taking care not to damage the threading.

If the shaft is badly bent, a new one should be made according to the sample.

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Broken trigger lock spring - If the spring is broken a new one should be made according to dimensions in figure 27, and after reassembling the working efficiency of the lock ought to be checked.

Assembling of the trigger lock is performed by reversing the procedure for disassembling.

Broken trigger roller - If the trigger roller is broken a new one should be made according to dimensions in figure 28. After reassembling check to see that the spacing between the roller and the auxiliary trigger lifter is about 3 mm. Check the correctness by firing, unloaded, with the auxiliary trigger.

f) REPAIRING THE SEMI-AUTOMATIC MECHANISM (FIGURES 29 - 35)

By the semi-automatic mechanism the following defects may occur:

- broken or weakened opening or closing spring,
- cracks on the connecting projections of the circular box with the guide,
- pounded material on the connecting dent of the circular box and the cover,
- damaged circular box bottom at the recess for connection with the semi-automatic retainer,
- damaged dent on the cover and projection for connection with the inner connector,
- damaged projection for connection on the inner connector,
- broken shaft dent of the semi-automatic mechanism for connection with the semi-automatic mechanism case,
- broken safety element of the semi-automatic mechanism shaft nut,
- worn projection on the semi-automatic mechanism shaft,
- broken dent on the case connecting to the shaft,
- broken dowel which fixes the position of the case in the breechring seating.

Broken or weakened opening spring - In both cases the spring should be replaced with a new one.

During adjustment of the spring take care that there are no great plays on the ends. Should they exist, fill out the space by placing shims of adequate shape. After replacing the spring the function of the semi-automatic mechanism should be checked by artificial recolling.

If satisfactory functioning of the semi-automatic mechanism is not attained after replacement of the spring, then a number of springs of various strengths should be tried until satisfactory results are obtained.

If by changing only the opening spring satisfactory functioning is not attained, then simultaneous changing of the opening and the closing springs should be tried and if necessary also the striker spring. In order to attain proper functioning of the semi-automatic mechanism adjustments of other parts are also approved,

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Broken or weakened closing spring - If the closing spring weakens or breaks it should be replaced with a spare or with one made according to dimensions in figure 30.

After replacement the functioning of the semi-automatic mechanism should be checked by artificial recoiling, and if the results are not satisfactory a new spring of more suitable strength should be selected within the tolerance limits given in the drawing.

Cracks on the connecting projections of the circular box with the guide - Should a crack occur the box ought to be replaced with a new one. When using a new box the general functioning of the semi-automatic mechanism parts should be checked and if necessary adjustments of individual dents on box parts, cover or inner connector ought to be made by filling or welding on.

Pounded material on the connecting dent of the circular box, cover and on the bottom recess at the connection with the semi-automatic mechanism retainer - If the material is pounded so much as to hinder proper extracting, a layer of electrode „Galeb 70” should be welded on this spot and machined. If the pounding is slight and under normal operation of the semi-automatic, the burr on the sides of the dent should be filled off, figures 31 and 32.

Damaged dent on the cover and on the projection for connection with inner connector - If there are cracks on the projection, then the cover should be replaced with a new one. During mounting of the new cover, if necessary, adjust the dent going under the handle of the semi-circular box, either by filling or welding on a layer of material on the dent in order to assure timely opening of the breechblock. If the dent is only worn out then a corresponding layer of material should be welded on the cover and machined under an angle of 22° . Following this the functioning of the semi-automatic should be checked.

Damaged connecting projection on the inner connector - If there is crack on the projection (or on the bolt passage channel) then the inner connector should be replaced with a new one.

Broken dent on the semi-automatic mechanism shaft - If the dent is broken, portion of material should be firstly taken off the projection and then new material added by welding on electrode „Galeb 70”. After welding machine according to dimensions in figure 33. The outlayed method of repairing should be considered as an emergency measure. Under normal circumstances the solution is replacement of the shaft with a new one. After mechanical machining, checking of assembling of the semi-automatic mechanism should be performed. The functioning check should be performed by artificial recoiling.

Broken safety element of semi-automatic mechanism nut - When the safety element breaks or gets lost, it should be replaced with a spare one or a new one made according to dimensions in figure 34.

Wornout projection on the semi-automatic mechanism shaft leg, figure 33 - When the projection wears out a layer of electrode „Galeb 70” should be welded on the whole contacting surface, following by fine machining of the projection because it should be very smooth. After machining the welded place should be superficially hardened and polished.

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with a stone. The hardness of the projection should be approximately 50 Rc, at the dept of 0.5 mm. Assemble the semi-automatic mechanism and by withdrawing only the barrel with the breechring and by pushing forward by hand, check whether all parts work correctly, and if necessary adjust the projection again.

If the projection is only slightly worn and on checking it is determined that it does not effect the functioning of the semi-automatic mechanism, then it should be only polished with the stone.

Broken dent on the case connecting with the shaft - When the dent on case breaks, a layer of electrode „Galeb 70“ should be welded on. However to avoid damaging the inside of the case a protecting copper plate should be pressed against the inner side. After welding the dent should be machined according to dimensions in figure 35, following by checking the possibility of assembling and functioning by artificial recoiling.

Broken dowel, which fixes the position of the case in the breechring seating - In such case the semi-automatic mechanism case should be replaced with a new one. In case the material is only slightly pounded on the sides of the dowel, welding on a electrode „Galeb 70“ is permitted. It should then be machined so that the spacing between the recess in breechring and the dowel is from 0.1 to 0.15 mm.

g) REPAIRING THE OPERATING CAM (FIGURES 36-44)

By cams the following defects may occur:

- bent or broken auxiliary trigger
- worn out cam
- jamming trigger raiser
- breaking of the auxiliary trigger lever spring
- breaking of the cam recuperator spring
- jamming of the cam fixing plug to the cradle
- damaged connecting recess of the square shaft handle for firing by the gunner,
- trigger raiser inoperative
- breaking of the gunner's firing handle
- wearing of the square on the firing shaft.

Bent or broken auxiliary trigger - If the auxiliary trigger is bent, the safety set screw should be unscrewed, the trigger removed from its shaft and straightened out without heating. If bending of the triggering handle caused also cracking of the welding or falling out of the handle from its seating, then it should be straightened out and welded, and if the handle had broken off, a new one should be made according to dimensions in figure 38. After assembling the functioning should be checked.

If the auxiliary trigger is broken a new one should be made, figures 39 and 40.

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Wornout operating cam - Owing to the wornout cam, the following improper functioning of the semi-automatic mechanism may occur: insufficient extraction of the case or it may occur that the breechblock even closes but fails to extract the case.

The wornout surface of the cam, over which the projection of the semi-automatic mechanism shaft rubs, should be heated and the layer of electrode „Galeb 70“ welded on. The welded surfaces should then be machined according to dimensions in figure 41. The machined surfaces should be well polished and the functioning of the semi-automatic mechanism checked by performing artificial recoiling and if necessary make re-adjustments. The semi-automatic mechanism functioning check should be made by applying three recoiling speeds as follows:

- with the recoiling speed regulator on „Opened“ - „O“
- with the recoiling speed regulator on „Normal“ - „N“
- with the recoiling speed regulator on „Closed“ - „Z“.

If by recoiling speed good results are obtained in extracting the cases, then the scratched surfaces of the operating cam should be re-polished and surfacially hardened to the depth of 0.5 mm. The surface hardness should be approximately 50 Rc.

Jamming of the trigger raiser - Jamming of the trigger raiser may occur owing to mechanical defects caused by corrosion. In case of trigger raiser jamming, the cam box should be disassembled as follows:

- remove the box cover screws,
- drive out the top and bottom pins with a punch and remove the trigger raiser and the spring.

After disassembling, remedy the places or clean the rust off friction surfaces. If necessary replace the trigger raising guiding shaft.

When opening the box, check the condition of other parts, especially functioning of the raiser dent and its spring. If the dent guiding shaft is wornout, it should be replaced with a new one. After assembling check the functioning again.

Broken auxiliary trigger lever spring - Open the cam box cover and replace the spring with a new one made according to dimensions in figure 42.

Broken operating cam recuperator spring - The broken recuperator spring should be replaced with a new one made according to dimensions in figure 43.

The movable portion of the cam should be disassembling as follows:

- draw out the lock pin from bottom side of the cam shaft and remove the washer,
- lift out the body of the movable portion of the cam and from the bottom side remove the spring fixing casing.

After the new spring is placed it should be given a certain pre-tension by rotating the cam body. After this has been performed, the cam should be forced into its seating, the washer in its place and secured with the cotter pin.

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The functioning of the operating portion of cam should be checked by moving it by hand. The spring should return the cam into its normal initial position so that the surface of the operating portion of the cam comes flush with the surface of the cam body over which the semi-automatic mechanism shaft projection slides.

Jamming of the cam fixing plug - If the plug gets jammed it should be disassembled as follows:

- drive out the pin from the hand-grip and the plug and remove the hand-grip,
- from the other side pull out the plug and the spring.

The damaged places should be repaired and the corroded parts cleaned. Grease lightly and re-assemble the cam fixing plug.

Damaged connecting recess of the square shaft handle for firing by the gunner - The damage may occur if the lifter dent stop screw unwinds and owing to this the recess makes an unobstructed passage of the square on the shaft impossible.

The damaged recess should be repaired by filing and the screw screwed to the necessary height so that the recess on the trigger raiser dent shaft comes into the horizontal position; then the screw should be tightened with the lock-nut from the inside of the cam box. When doing this the box cover should be removed.

Trigger raiser inoperative when pulling the auxiliary trigger - Open the cam box and drive out the broken pin on the trigger raiser dent and replace it with a new one. After re-assembling check the functioning.

Gunner's firing handle broken - Drive out the pin from the shaft which fixes its position by the left side seating and pull the shaft out. On the joint of the shaft with the handle remove the welding and drive out the broken handle. According to dimensions in figure 44, attach the new handle on the shaft and weld it on with electrode „Triglav“.

It is also permitted to weld the broken handle with electrode „Triglav“ when a new one is not available. Naturally the welded place should be smoothened with a file.

The angle of the handle on the shaft in respect to the shaft square should be 22° .

Wearing of the square on the firing shaft - The worn square on the firing shaft should be repaired by welding on a layer of material with electrode „Triglav“ and then machining it square with a side of 12 mm. If in spite of this there still is a play in the recess on the cam box shaft, a layer of material should be welded on in the recess also and machined to size 12 mm, and the checked to make sure the recess coincides horizontally with the recess of the cam body.

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C. REPAIRING THE TRAVERSING MECHANISM (figures 45-51)

a) DISASSEMBLING OF THE TRAVERSING MECHANISM

Disassembling of the traversing mechanism is permitted only in cases when certain parts are damaged or broken, as well as during general cleaning and inspection of weapons in the workshop.

Disassembling of this mechanism may be performed without removing of the operating parts of the weapon. Parts attached to the side and to the base of the carriage body may be disassembled independently.

To disassemble the traversing mechanism, (figure 45) proceed as follows:

- detach the traversing mechanism spindle drive out the pin from the joint,
- unscrew the nuts from guard bracket and draw out the guard brackets together with the worm case,
- removed the screws from case cover,
- unscrew the lock from the upper side of the case and unscrew the bushing which supports the bevel gear,
- unscrew the fixing screw of the bevel gear to the worm shaft and remove the bevel gear from the shaft,
- unscrew the lock screw of the bearing support,
- unscrew the ball bearing support from the casing,
- take out the shaft with the worm from the casing,
- to disassemble the bushing drive out the pin, unscrew the joint and then from the opposite side take out the bevel gear with the shaft,
- drive out the bronze bearings from both sides of the bushing,
- drive out the ball bearing from the bearings support,
- unscrew the safety screw from nut from the inner side of the carriage body,
- unscrew the nut from the inner side of the carriage body and remove the mechanism support with the joint, spindle and handle,
- drive out the pin from the joint and from the handle,
- unscrew the joint and then the spindle with the handle and drive out the pin from the mechanism wheel,
- drive out the bronze bearings from the bushing,
- from the traversing mechanism wheel unscrew the handle fixing screw and remove the handle,
- unscrew two screws from the side of the toothed sector of the traversing mechanism and then drive out three pins from the upper side of the mechanism sector support and remove the bronze toothed sector.

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b) REPAIRS OF THE TRAVERSING MECHANISM

By the traversing mechanism the following defects may occur:

- great play between the worm and toothed sector,
- great play between the bevel gears,
- worn bronze bearings,
- loosened joints,
- bent spindle,
- bent wheel handle.

Great play between the worm and toothed sector - To eliminate the great play in attempt should be made to bring the shaft in the assembly with the box nearer to the toothed sector by changing, filing the spacing washers between box and the top carriage and if the play is greater, then the sector should be replaced with a new one according to dimensions in figure 45.

Great play between the bevel gears - The great play between the bevel gears may be caused by wearing of the head surface of the bronze bearing. The play is being eliminated by replacing of the bronze bearing in the bushing. After inserting of the new bronze bearing made according to figure 47, the engagement of gears should be checked and if necessary the bearing surface should be adjusted.

Worn bronze bearing - If the bronze bearings are so much worn that the traversing mechanism labours and the spindle shakes, the bronze bearings should be driven out and replaced with new ones made according to dimension in figure 43. After inserting the new bearings, check the functioning of the mechanism and by measuring the force required to turn the handle check whether the bushings are properly set and if necessary adjust them with the scraper.

Loosened joints - If the joints wear loose, replace them with new ones according to figure 49. If the joint is only slightly worn loose, is an emergency measure it may be tightened by tapping with a copper hammer.

Bent spindle of the mechanism - If the spindle is only slightly bent it may be straightened without heating and if it is seriously bent it should be replaced with a new one according to dimensions in figure 30. After repairing check the functioning of the mechanism. The turning should be easy, smooth and without interruptions.

Bent handle on the wheel - Try to straighten the handle screw without heating and if it does not straighten out completely so that it easily turns, then a new one should be made according to dimensions in figure 51.

Note: The permitted play by good functioning traversing mechanisms is a quarter turn of the wheel. Should the play be greater it is necessary to find the cause and then to proceed as outlined above.

D. REPAIRING THE BARREL ELEVATING MECHANISM (figures 52 and 53)

a) DISASSEMBLING THE BARREL ELEVATING MECHANISM

Disassembling of the barrel elevating mechanism is permitted only in workshops when general cleanings and inspections of the weapons are performed and in cases of broken parts.

Disassembling of mechanism parts which are fixed on the left-hand side of the carriage may be performed without disassembling the weapon and the parts on the cradle may be disassembled only when the cradle is removed, figure 53.

The elevating mechanism spindle during disassembling is being taken apart in two parts of which one part remains on the worm casing and it is being fastened with a spring, and the other remains on the left side of the carriage and with its welded on plug is fixed to the top carriage.

In order to disassemble the elevation mechanism parts located on the carriage body, proceed as follows:

- tilt the cradle so that it may be removed from the carriage body,
- disconnect the elevation mechanism spindle,
- remove the bronze nut located on the part of the spindle with the brass handle,
- remove the part of the spindle with the handle,
- remove the spindle spring,
- remove the handle wheel fixing pin,
- unscrew the hand wheel to the left,
- remove the hand wheel,
- unscrew the set screw on the treaded bushing,
- remove the bevel gear,
- unscrew the bevel transmission casing cover,
- unscrew the screw on the inside of carriage body holding the screw which has a hole on the top to receive the other end of the bevel gear shaft,
- remove the bevel transmission casing and from the casing,
- remove the part of the spindle having the bevel gear.

In order to disassemble the elevation mechanism parts located on the cradle, proceed as follows:

- remove the cradle from the carriage,
- remove the pin by the spindle joint,
- remove the worm screw casing cover,

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- unscrew the regulating nut safety screw,
- unscrew the worm regulating screw,
- remove the shaft fastening nut on the small casing located on the right side of the cradle,
- unscrew five screws and separate the gear case from the cradle,
- remove the shaft with pinion and worm gear and
- remove the worm screw, (unscrew six screws).

b) REPAIRING OF THE ELEVATION MECHANISM

The following defects may occur in the elevation mechanism:

- great play between the gears and the gear sector of the elevation mechanism,
- play between the worm and worm wheel,
- play in the bevel gears,
- bent elevation mechanism spindle,
- damaged gear dents,
- cracks in the cast casings,
- loose joints.

Great play between the gears and the gear sector - The play at this place is generally the result of worn bronze bushings of the elevation mechanism. The worn bronze bushings should be driven out from the casings and replaced with new one made according to dimensions in figure 54. After inserting of the new bronze bushings, the elevation mechanism should be assembled, its functioning checked, and if necessary the bushings should be re-adjusted. The force necessary for moving of the handle should not be greater than 3.5 kgr.

The play between the worm and the worm wheel - The play between the worm and the worm wheel results from wornout worm wheel.

If the worm wheel is too worn it should be replaced with a new one. After replacing, the worm wheel should be revolved several times by means of the worm and if necessary some places should be polished if tightness exists.

The play in the bevel gears - The play in these parts results. From over wear of the carrying surfaces of the bronze bushings. To eliminate the play, the bronze bushings should be replaced with new ones made according to dimensions in figure 55. After the new bushings are inserted the bevel gears should be assembled. The small bevel gear with its shaft should easily fit in its seat in the screw head, otherwise the carrying surface of the bronze seating of the big gear should be machined to fit. After assembling of the mechanism the functioning should be checked with the gun assembled.

The bent elevation mechanism spindle (figure 56) - If the spindle bends it should be straightened without heating. If the elevating crank, which is soldered on, falls off, the old solder should be well

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cleaned and the crank re-soldered using a bigger layer of solde. After soldering the rough surfaces should be smoothened, figure 57.

The damaged gear dents - The damaged dents in the gears should be filed clean. If any dent is damaged so that it cannot be remedied by filing, welding on of a layer of material with electrode „Galeb 70“ is permitted. After welding the dent should be shaped.

The cracks in the cast casings of the elevating mechanism - If the crack is small it should be broadened with a cold chisel and then welded. In order to eliminate the tension the repaired casing should be annealed. If the space permits a rib may be welded on from the outside over the crack. After welding and annealing, the mechanism should be assembled to make sure that the casing is not deformed. Deformation of the casing would cause difficulties in functioning of the mechanism. Prior to welding the casing should be removed from the cradle. In case of deformation only slight adjustments of the bronze bushings, shafts, are allowed, otherwise the casing should be replaced with a new one.

The loose joints - When the joints get loose the remedy by means of cold hammering with a copper hammer should be tried, and if this does not help then new ones should be made according to dimensions in figure 58.

Notice: The allowed play by elevation mechanism is 1/4 turn of the elevating wheel. If the play should be greater, the cause must be found and remedied as outlayed above.

E. REPAIRING OF THE HYDRAULIC RECOIL BRAKE AND THE RECUPERATOR

GENERAL RULES

a) Disassembling, repairing and assembling of the hydraulic recoil brake and the recuperator may be performed only in specially equipped workshops for doing repairs. The hydraulic system possesses very precisely machined internal surfaces, which may be damaged due to mechanical impurities or corrosion. Owing to this the premises in which the disassembling and assembling is performed must be very clean and have a uniform temperature. Because of the sensibility of the surfaces in the hydraulic recoil brake and in the recuperator disassembling and assembling may be performed by well trained personnel only, who are fully familiar with this weapon and with the accessories. Owing to the recuperator it is strictly forbidden and very dangerous to allow inexperienced personnel to disassemble.

b) Changing of the fluid „Steel MM” in the hydraulic recoil brake and in the recuperator with fresh fluid should be done at least every five years for the purpose of preventive maintenance of these weapons. Complete changing of the fluid should also be done in cases when during checking it is discovered that the fluid is sour. Prior to changing of the fluid all internal surfaces of the hydraulic recoil brake and recuperator must be properly cleaned. Only combined with detailed cleaning the changing of the fluid will be advantageous for protection of parts from the unfavourable effects of the old fluid which may be the cause for corrosion.

Aside from the regular five year changing of the fluid „Steel MM”, in all weapons now filled with „Steel MJ” the fluid must be replaced with „Steel MM” and the existing leather jointings must be replaced with rubber jointings.

Regardless of whether the regular five year changing or changing for the purpose of switching from „Steel MJ” to „Steel MM” as well as replacement of leather with rubber jointings, in all the prescribed procedures should be followed. During disassembling of the hydraulic recoil brake and the recuperator all parts, and especially those which have been in any way in contact with the fluid, must be well dried directly after disassembling. Nowhere should any spots from old tallow remain uncleaned because they may contain acids or salts.

c) Prior to filling the hydraulic recoil brake with „Steel MM” the fluid must be tested to make sure that it complies to the requirements. If the fluid is not being tested just before filling, then it must be accompanied with the certificate of the responsible organisation—laboratory, stating that the fluid conforms to the specification. Without such document changing of the fluid should not be started.

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i) The quality of the rubber jointings must be in conformance with the specification for perbunan rubber, and besides they must be properly stored. Prior to changing of rubber jointings they must be checked, by bending, to make sure that they did not get brittle. Improper storing of rubber jointings makes them get stale quickly and they become brittle and therefore must not be used in the weapon.

e) Leather jointings must not be inserted into the hydro-elastic system except under special circumstances. In such cases the leather jointing, that is, the leather of which it is made must be acid free.

f) The tallowy wick for jointing must not be prepared in salty tallow. The tallow which is being used for saturating the wick, leather or for the purpose of greasing threadings must be absolutely pure and without salts. A dry wick, prior to inserting into the weapon, may be saturated in a mixture of paraffin and tallow or stearine (ratio 50:50) in which approximately 1% of fine graphite is mixed.

g) Filling of the recuperator should be done only with azote. In weapons which are filled with compressed air, the change to azote should be made as soon as possible. In order to make the change efficient also inspection and cleaning should be performed at the same time. Switching from air to azote without first eliminating the signs of corrosion in the recuperator parts would be to no avail.

CLEANING OF THE HYDRAULIC BRAKE AND THE RECUPERATOR

Always after disassembling of the hydraulic recoil brake and the recuperator in any scope the parts should be carefully from dirt, and especially from signs of corrosion, if any residue of tallow and tallowy wick. Special attention should be given to cleaning of the parts during changing of the fluid in the hydraulic recoil brake.

The disassembled parts should be washed and brushed until the dirtiness is removed. The washing of the parts should be done first in hot solution of water and washing soda or soap. The solution for washing should be made in following proportion: in 5 litres of hot water 200 grams of washing soda powder or 150 grams of soap powder should be added. With this solution parts from 4-5 weapons may be cleaned provided that they are not too dirty.

After washing in the solution, the parts should be rinsed in clean hot water, dried with rags and inspected for the purpose of determining the degree and the damaged place on the corroded parts.

Slightly corroded places in the recuperator cylinder, which may be expected in the zone of the jointing, should be polished off with a crocus, rag. In case the corrosion has already damaged the surface, the cleaning should be made with the tools for cylinder cleaning as explained under the headings „Repairing of the hydraulic brake or the Recuperator“.

After cleaning of all parts of the hydraulic recoil brake and the recuperator and if not being assembled immediately, they should be slightly greased. Handling the clean surfaces with bare hands should be avoided. For this purpose linen gloves or rags should be used.

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a) DISASSEMBLING OF THE HYDRAULIC RECOIL BRAKE (figure 59)

Disassembling of the hydraulic recoil brake and the recuperator is performed at the time of changing the fluid in the workshop and when it is necessary to replace defective parts.

To disassemble the hydraulic recoil brake:

- remove the barrel with the breechring and the mantle,
- remove the protecting box from the cradle,
- unscrew with a wrench the two lock nuts from the counter piston rod,
- remove the ring with the arc-shaped rack from the counter piston rod,
- take a clean container and put it under the front end of the cradle,
- remove the bronze washer,
- unscrew with a socket wrench the stuffing box from the counter piston rod and slightly pull out the counter piston rod,
- lower the barrel in order to get depression and thus allow the fluid to get out,
- unscrew with a socket wrench the two nuts from the piston rod extension at the rear end of the cradle,
- remove the piston rod connector,
- unscrew with a socket wrench the stuffing box from the right cylinder, figure 51,
- pull out backwards the piston rod together with the counter piston rod,

To take out the counter piston rod it is necessary:

- to unscrew the three screws fixing the piston,
- to unscrew the piston, retaining the piston rod extension by means of the connector,
- to pull the counter piston rod out of the piston rod.

In order to remove the counter-recoil shock-absorber:

- unscrew the shock-absorber retainer,
- unscrew the shock-absorber,
- remove the valve with the spring,

To remove the piston with the counter piston rod:

- unscrew the piston rod to the left.

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To remove the stuffing box from the piston rod:

- unsolder and remove the solder,
- knock out the pin in front of the ring on the rear part of the piston rod,
- unscrew the piston rod extension to the left,
- remove the stuffing box from the piston rod.

For disassembling the stuffing box the counter piston rod:

- unscrew with a socket wrench the tallowed wick tightening nut from the rear side,
- remove the tallowed wick,
- unscrew with a socket wrench the nut tightening the rubber ring from the rear and the front side of the box,
- remove the rubber ring.

The disassembling of the recoil brake stuffing box is done in the same way as disassembling of the counter piston rod stuffing box, as laid out above.

b) DISASSEMBLING OF THE COMPENSATOR (figure 52)

In order to disassemble the compensator:

- unscrew with a hexagonal socket wrench the stuffing box from the front part of the middle cylinder,
- remove, with pliers, the compensator piston,
- pull out the compensator spring,

To disassemble the compensator piston it is necessary to:

- unscrew the rubber ring tightening nut,
- remove the rubber ring,
- remove the steel ring,
- unscrew the compensator shaft.

To disassemble the „T“ marked valve (figure 53) it is necessary to:

- unscrew the bolt marked „T“ and take out the rubber jointing,
- unscrew the stop screw,
- unscrew the spring, the ball pusher and the ball,
- unscrew the safety screw,
- unscrew the valve body,
- remove the copper jointing.

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Notice: If the hydraulic brake is being completely disassembled for the purpose of repairing it, the azote should be released before starting the repairs.

c) DISASSEMBLING OF THE PNEUMATIC RECUPERATOR (figure 53)

It is not allowed to disassemble the recuperator for training purposes. Only skilled personnel-artillery mechanics are allowed to perform this operation. In order to disassemble the pneumatic recuperator:

- remove the barrel with the breech-ring and the mantle,
- remove the azote filler valve case cover,
- unscrew the plug from the seat of the three-way tube,
- loosen the valve for one turn to the left,
- let all the azote escape from the recuperator,
- unscrew the two screws fixing the counter-recoil speed regulator index from the rear part of the middle cylinder,
- take a clean container and place it under the middle cylinder,
- unscrew, with a socket wrench, the stuffing box with the counter-recoil speed regulator and remove them from the cylinder,
- elevate the barrel in order to let out the whole quantity of fluid,
- pull back the piston rod,
- unscrew the stuffing box with the socket wrench,
- pull the piston rod and the stuffing box and remove it together with the piston and piston rod,
- drive out the pin from the piston rod extension,
- unscrew the piston rod extension to the left,
- remove the stuffing box from the piston rod,
- unscrew the cover of the left cylinder on the front portion of the cradle,
- take a wrench for removing the floating piston and push the floating piston forward in order to seat the spring pusher onto the square boss on the rear part of the bulk-head,
- give 4-5 turns to the wrench for removing the floating piston in order to loosen the Belleville springs and at the same time the rubber ring on the piston,
- remove the floating piston.

In order to disassemble the floating piston, figure 54:

- remove the floating piston from the wrench by means of which it has been taken out of the cylinder,
- unscrew the Belleville spring pusher,
- remove the bronze case with the springs,

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- remove the Belleville springs and the washer from the case,
- remove the rubber sealing ring,
- remove the bronze nut with the scissors wrench,
- remove one rubber ring,
- from the rear side of the piston unscrew with the scissors wrench the rubber ring tightening nut,
- remove the second rubber ring,
- remove the steel ring.

In order to disassemble the recuperator fluid refiller valve, figure 55:

- unscrew the set screw from the shaft,
- remove the screw with the rubber jointing,
- unscrew the fluid refiller valve body and remove the jointing,
- remove the valve piston,
- remove the small valve spring.

The large valve spring, located on the shaft in the box is removed when disassembling the box.

In order to disassemble the stuffing box,

- containing the nut from the front part of the piston rod,
- remove the valve spring,
- remove the counter recoil control valve,
- unscrew the front ring on the stuffing box to the left,
- remove the rubber jointing,
- unscrew the stop screw securing the valve regulator, to the shaft,
- unscrew the regulator head to the left,
- unscrew the rubber ring tightening nut,
- pull out the shaft from the case body forward together with the spring,
- unscrew with a socket wrench, the front rubber ring tightening nut from the side of the stuffing box,
- remove the rubber ring,
- remove the steel ring from the rear side and the rubber jointing.

In order to remove the rubber buffer, figure 59:

- unscrew the four screws attaching the buffer,
- remove the buffer.

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In order to disassemble the recuperator stuffing box, figure 66:

- with a scissors wrench unscrew the front rubber ring tightening nut,
- remove the rubber ring,
- unscrew, with a scissors wrench, the rear rubber ring tightening nut,
- remove the rubber ring,
- remove the steel ring.

In order to disassemble the recuperator piston, figure 67:

- remove the cotter pins from the front and rear side of the piston,
- unscrew the nut from the front part of the piston,
- remove the washer,
- remove the piston bronze head,
- remove the front rubber ring,
- unscrew the rubber ring tightening nut and slide it down along the piston rod,
- remove the rubber ring and the steel ring sliding them down along the piston rod.

In order to disassemble the recuperator air filler valve case, figure 68:

- unscrew the cover fixing screw,
- remove the valve cover,
- unscrew, with a wrench, the plug of the three-way tube seating,
- unscrew, with a screw driver, the valve nut locking screw,
- unscrew the valve nut,
- remove the valve with the rubber jointing.

To remove the recuperator working cylinder, figure 69:

- remove the valve case,
- unscrew, with a wrench, the nut from the rear part of the left cylinder,
- screw on the left cylinder cover,
- unscrew, with a wrench, the working cylinder to the left,
- remove the working cylinder.

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d) ASSEMBLING OF THE HYDRAULIC RECOIL BRAKE, THE PNEUMATIC RECUPERATOR AND THE RECOIL-LENGTH REGULATOR

The assembling of the recoil brake and the recuperator is performed by reversing the procedure for disassembling.

In doing it, it is necessary to give special attention to the following:

a - In assembling the hydraulic recoil brake

- Take care to install correctly the buffer with the counter-recoil shock absorber valve, or else malfunction of the recoil brake would result,
- take care to place correctly the tallowed wick packing,
- when assembling the compensator, compress the spring through the opening of the lower side of the cradle to enable screwing in the stuffing box,
- prior to placing the stuffing box it is necessary to remove all of the copper rings from the cylinder, to heat them red-hot and merge them into clean water,
- when placing the parts of the recoil length regulator onto the counter piston rod, take care to coincide the marks on the counter piston rod with the marks on the ring and to coincide with each other the marks on the arc-shaped racks,
- prior to screwing in the stuffing box it is necessary to grease its threads with tallow mixed with graphite powder,

b - In assembling the recuperator

- 1 - When assembling the floating piston, care should be taken:
 - to place correctly the Belleville springs,
 - to connect all of the parts only loosely, because if tightened, the rubber ring would expand and the floating piston could not be installed in the cylinder,
 - when inserting the floating piston into the cylinder it is necessary to slip it upon the square boss on the middle cylinder bulk-head by means of the Belleville spring pusher,
 - the floating piston must be tightened to a point that one man can move it with a puller wrench along the cylinder, i.e. with power of 25 kg,
 - after the floating piston has been tightened it must be pulled to 250 mm distance from the rear end of the cradle, as marked on the puller wrench. (Special care should be given to it).
- 2 - Prior to installing the stuffing box all the copper rings should be taken out of the cylinder, heated to red-hot and merged into clean water.

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- 3 - The recuperator is first filled with fluid and then with azote.
 - 4 - Prior to screwing in the stuffing box, it is necessary to grease the threads with tallow.
 - 5 - Prior to installing the inner recuperator cylinder it should be coated with vaseline, and the same should be done with the inner part of the outer cylinder.
 - 5 - When installing the stuffing box with the counter recoil speed regulator, the box should be so screwed that the opening of the box be turned facing the opening between the left and the middle cylinders. In order to achieve this, it is necessary to coincide the marks on the stuffing box and on the cradle.
- c - **Assembling the recoil length regulator**
- Special attention to be given to the following when assembling:
- bring the barrel in horizontal position, and check it by means of the gunner's quadrant,
 - align the counter piston rod in the right cylinder so that the mark (cut den) on the counter piston rod matches the mark on the recoil brake cylinder,
 - the arc-shaped racks should be installed so that the corresponding marks coincide,
 - the length of the rod should be adjusted so that the mark for elevation „C" (zero) faces the mark on the bracket,
 - when tightening the nut on the counter piston rod, care should be taken that inside nut does not tighten the gear segments so as to prevent proper function of the whole regulator.

e) REPAIRING OF THE HYDRAULIC RECCIL BRAKE

The following defects may occur in the hydraulic recoil brake:

- insecure connection of the barrel with the hydraulic recoil brake and the recuperator,
- excessive recoil length,
- short recoil length,
- barrel recuperation with a shock,
- leakage of fluid at the rear stuffing box,
- leakage of fluid at the connection of the piston rod extension,
- weakened compensator spring,
- damaged compensator piston jointings,
- leakage of fluid at the front stuffing box,
- unscrewed recuperator shock absorber,
- improper functioning of the recoil length regulator,
- corroded recoil brake cylinder,

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- corroded recoil brake piston rod,
- defective fluid-re-filling valve.

Insecure connection of the barrel with the recoil brake and the recuperator occurs owing to the broken or weakened connector fixing spring. The weakened or broken spring should be replaced from the spares set or a new one made according to dimensions in figure 39.

Excessive recoil length - The cause for the excessive recoil length may be:

- lack of fluid in the recoil brake,
- unscrewed recuperator shock absorber,
- worn piston rod head,

If there is insufficient fluid it should be filled until the compensator spring is so compressed that four coils of the spring may be seen through the opening on the cradle. Properly filled recoil brake should contain 1.2 litres of fluid "Steel M". Excessive recoil length may be also caused by lack of pressure in the recuperator. The pressure in the recuperator should be checked and if necessary increased to 32 atm by filling.

Unscrewed recuperator absorber also may be the cause for excessive recoil length. If the recuperator shock absorber should be unscrewed, the barrel recuperation will be fast and with a shock. In such case the hydraulic recoil brake should be disassembled and the piston rod with the counterpiston rod taken out. As to make possible the screwing of the shock absorber, the safety element on the piston rodhead should be loosened first and then the piston rod bronze head unscrewed so that it remains on the counter piston rod. Before screwing on of the recuperator shock absorber to the counter piston rod all the belonging parts should be checked: the valve, the valve spring and also the shock absorber. After assembling and screwing-on of the recuperator shock absorber, the counter piston rod should be inserted into the piston rod and secured against unscrewing with screws on the head. After screwing-on, the head must come in the same position it had prior to unscrewing. The marks on the head and on the piston rod must coincide.

Should the piston rod bronze head be so much wornout that its diameter, which slides in the cylinder, measures less than the recoil for 0.3 mm, and the recoil length cannot be properly adjusted by means of the regulator, what ought be checked (see regulating instructions), then the bronze head of the piston rod must be replaced with a new one. It is not permitted to make a new head in the shop because to make it special anti-friction material and special resistance testings are required.

The diameter of the spare bead is 0.5 - 1.0 mm greater than the diameter than the recoil brake cylinder. Therefore the following should be done:

- measure the inner diameter of the recoil brake cylinder,
- machine the piston rod bronze head to a diameter which would be 0.14 mm smaller than the measured cylinder diameter at the narrowest place,

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- mark exactly the center of the smallest flowing opening and draw a line to reach the end of the head,
- slide the head on the piston rod and then assemble the recuperator shock absorber,
- screw the head on the piston rod so that the mark line coincides with the mark line on the piston rod. Should the mark line on the piston rod not be visible, it should be strengthened only at the place by the thread for screwing-on the head. This line must be located on the symmetric of the extension bolt,
- the screwed head should be checked by building-in into the hydraulic recoil brake as prescribed for regulating of the recoil brake,
- if, during adjustment, the holes on the head in relation to the grooves of the piston rod should show the situation as prescribed in adjusting instructions under 28 and 40°, then the head may be locked with three safety screws. When making the screw setting in the piston rod take care that the point of the bit does not go deeper than 0.70 mm,
- after this assemble completely and fill up the recoil brake,
- assemble the weapon for firing and then pull back the barrel at least ten times and observe its functioning,
- carry out firing with elevation 7° and 45° using the fourth propellant charge. The recoil lengths must be within limits prescribed in the recoil tables on the weapon.

SHORT RECOIL LENGTH

Too short recoil for a determined barrel elevation strains the parts of the weapon and may impair the stability of the gun and in some cases may lead to breaking of individual parts. As soon as it is discovered that recoil lengths are under prescribed standards, the cause should be searched for, which may be:

- improperly adjusted recoil brake,
- excessive pressure in the recuperator,
- excessive quantity of fluid in the recuperator,
- friction in the recoil brake,
- friction in the cradle slides.

Improperly adjusted recoil brake - The gears of the recoil length should be checked to see whether they are properly set so that the mark on one gear is located between the two marks on the other gear. Besides, check to see whether the counter piston rod gear is properly set, i.e. that the mark on the gears comes on the recessed dent of the counter recoil rod gear. If the gears position is correct then, if necessary, the mark "C" should be brought to coincide with mark on the recess of the regulator lever. Should the recoil length still be short then the whole adjustment should be repeated as given in the recoil brake regulating instructions.

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Excessive pressure in the recuperator - Overpressure in the recuperator will cause shortening of recoiling, especially when using small elevation angles. Therefore the pressure should be checked and if necessary corrected.

Should the pressure in the recuperator be increased due to intensive firing and increased external temperatures, and this is the cause for shorter recoil length, then the pressure from the recuperator should not be released because of cooling off pressure will come down to the standard.

Excessive quantity of fluid in the recuperator - Filling the recuperator with more fluid than prescribed will cause shortening of the recoil length and may lead also to damaging the middle cylinder bulkheads. If there is too much fluid, the floating piston is forced to hit the bulkhead in the middle cylinder and thereby putting too much strain on the parts what may result in undesirable consequences.

In order to avoid the above, special attention should be given to adding fluid into the recuperator.

Friction in the recoil brake - Accumulation of bronze in the cylinder and on the counter piston rod may lead to great friction and also to part freezing to cause considerable shortening of the recoil length. Should it come to this, the pressure in the recuperator ought to be released and the recoil brake disassembled. The accumulated bronze should be cleaned from off the frozen parts taking care not to damage the material. If the accumulation is on the cylinder walls, they should be removed by means of the cleaning tools as described in this heading. Special care should be given to the cleaning of bronze accumulated on the counter piston rods owing of the existing grooves because by careless cleaning of the bronze the fluid flowing conditions may change. If the freezings occur in contact of the piston rod with stuffing boxes, the piston rod may be uniform ground along the whole length provided the outside diameter of the piston rod is not reduced under $\phi 31.75 \pm 0.04$ mm because in this case the sealing would not be guaranteed.

Friction in the cradle slides - Accumulation of bronze on the cradle slides may also influence the shortening of the recoil length. This will occur mostly when the slides are not greased and unclean. In such cases the cradle jacket should be removed, the slides cleaned with a scraper and the cleaned places polished.

Barrel recuperation with a shock - As soon it is noticed that after firing a round the barrel recuperates with a shock, steps should be taken at once to remedy the defect because the barrel recuperation with a shock may cause various defects:

The barrel recuperation with a shock may be caused by:

- improper position of the recuperation speed regulator,
- defective regulator, or
- unscrewing of the recuperation regulator on the counter piston rod; these two defects occur due to the damaged recuperator.

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Leakage of fluid at the rear stuffing box - If leakage of fluid on the rear stuffing box is discovered, eliminating of the leakage should be tried by tightening of the regulating nut. After this, if the fluid still leaks the stuffing box should be unscrewed and all defective jointings and the tallowy wick replaced. When doing this, the piston rod should be checked to see that it did not corrode at the places of contact with the packing. If the corrosion on the piston rod has gone deeper, then the repair should be done by machining on a lathe, cutting a channel on the piston rod so deep and wide to remove the corrosion. Such cut channel should be filled out with tin and machined even to the size of the part of the piston rod. Prior to applying the tin, the piston rod should be well degreased and after the tin has been applied, this place should be dipped in a 10% solution of ammonia soda for 10-15 seconds and then rinsed in hot water. This must be done or otherwise the remains of salts and acid would cause greater corrosion than before.

When the leakage appears on the threading, the copper jointing should be replaced if the leakage fails to stop after tightening the stuffing box.

Leakage of fluid at the connection of the piston rod extension - If found that the fluid is leaking at the piston rod extension connection, the piston rod with the extension should be taken out of the recoil brake, the extension connection unsoldered, the unsoldered place cleaned and degreased and then a check made to see whether the extension is screwed to the end.

If the connection is loose, a layer of material should be taken off the piston rod face so much as to after tightening of the extension the marks on the piston rod and on the extension coincide again to insure the correct position of the extension in relation to the holes on the piston rod head. If the marks are not clearly visible, prior to disassembling they should be strengthened. When the extension is screwed tight on the piston rod and the marks coincide, then application of tin on the connection may start. After the tin has been applied the piston rod should be dipped into a 10% solution of ammonia soda for 10-15 seconds following up with rinsing it in hot water.

Weakened compensator spring - If the spring of the compensator gets so weak that it is not capable of moving the compensator piston, it should be replaced. Measure the height of the spring and if it is less than 170 mm replace it with a new one from the spares set.

Damaged compensator piston jointing - Damaging of jointings in the compensator may occur owing to striking of the jointing against the cylinder walls or owing to corrosion in the cylinder. A defective jointing should be replaced and when replacing it the cylinder should be cleaned with the cleaning tool. After cleaning, the cylinder should be washed well, greased with gun grease, and the compensator spring dipped in preservation means for protection against corrosion.

Leakage of fluid at the front stuffing box - If fluid leakage appears at the front stuffing box of the hydraulic brake, the regulating nut should be tightened and then checking ought to be made to see that the friction is not too great when the counter piston rod is turned. To make this check, it is necessary to disconnect geared sector or recoil length regulator and if the counter piston rod can be easily turned it

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means that the friction is satisfactory. Otherwise the regulating nut should be unscrewed and the tallowy wick replaced. When changing the tallowy wick, all parts should be cleaned well from the tallow residue and other contaminations.

After re-attaching of the gear to the counter piston rod, make sure it is not too tight against the cradle face washer this would create great friction and improper functioning of the recoil length regulator. Take care to connect properly the regulator gear.

Improper functioning of the recoil length regulator, (figure 70) - A defective recoil regulator may cause improper recoil lengths and also trouble in disassembling and assembling of the cradle with the top carriage.

In case improper recoil lengths are obtained, the recoil brake adjustment should be checked and in case a defect is detected it should be eliminated.

The regulator may suffer the following defects:

- cracked roller on the regulator lever,
- loose connection of the recoil length regulating nut,
- cracked welding on the recoil length regulator lever brackets,
- bent regulator lever.

Cracked roller on the regulator lever - If the roller on the regulator lever cracked, it should be replaced with a spare one or new one made according to dimensions shown in figure 71. When replacing, the pin should be driven out from the lever, the roller carrying screw unscrewed, the new roller replaced and the roller carrying screw screwed into the lever and the safety prior inserted. Before putting in the safety pin a check should be made to see that the roller turns freely.

Loose connection of the recoil length regulating nut - If the connection of the lever with the recoil length regulating nut is loose it should be remedied, because of this, varying recoil lengths may be obtained. Loose connection is caused by broken metal safety elements between the lock nuts. In order to repair this defect, the nuts should be removed and safety elements replaced with new ones according to dimensions in figure No. 72 and the regulating should be checked by bringing the mark on the lever in proper position. After the regulating is checked the ends of the metal safety elements should be bent.

Cracked welding on the recoil length regulator lever brackets - The cracked welding on the regulator lever brackets should be cut out with a cold chisel so that the old welding is completely removed. The welded place should be cleaned from paint and grease and then re-welded. Attention should be paid not to change the position of the brackets, because this may cause freezing of the lever in the bracket settings.

In longitudinal direction the lever must be movable by hand. All works on welding may be performed without draining the fluid from the recoil brake.

Bent regulator lever - Most often the rear portion of the lever by the roller bends. If this should happen the lever ought to be disassembled and taken out from the settings in the brackets and lever

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straightened without heating. If necessary, first remove the welding off the rear lever bracket and then remove the roller off the lever to avoid its damaging. After the lever is straightened a check should be made to see that the cam on the top carriage is not damaged and that this is what causes the improper functioning of the regulator. If the cam is damaged it should be repaired by filing or, if necessary, replaced.

When re-attaching the lever make sure the center of the roller is placed in its proper position. Therefore prior to final welding of the lever bracket to the cradle, the bracket should be spot welded only and the regulating checked.

Corroded recoil brake cylinder - The corrosion in the recoil brake cylinder may appear mostly on the front end of the cylinder, especially if the weapons was without sufficient fluid in the cylinder over a longer period of time. This should be kept in mind and in case addition of fluid in the recoil brake cylinder is being performed, which was without sufficient fluid over a longer period of time, it will be necessary to inspect and clean the recoil brake cylinder before filling the fluid. In order to perform this it is necessary to:

- remove the protecting cover from the cradle,
- remove the recoil length regulator parts,
- unscrew the front stuffing box,
- carry out inspection and if the cylinder has corroded disassemble the whole recoil brake together with the compensator.

The cleaning of the corroded recoil brake cylinder should be performed with the cleaning tool according to figure 73.

The cradle should be set in a vertical position and tightened and the cleaning tool inserted into the cylinder. The tool rod should be tightened in the electric hand drill and the approximate length marked on the tool rod to correspond with the depth of the corroded place in the cylinder.

The electric hand drill should be started and the internal part of the cylinder gradually wetted at the place where the corrosion is being removed. During this operation care should be taken that the cleaning tool rod is always approximately in the center of the cylinder and vertical in relation to the cylinder axis. The cleaning tool should be lowered into the cylinder gradually to avoid scratching of the cylinder surface if the tool is moved too fast. The cleaning tool should be worked slowly up and down the cylinder to avoid sudden changes in cylinder diameter. The time required for cleaning depends on the depth of the corrosion. When the corrosion disappears, the cleaning tool should be withdrawn to the mouth of the cylinder while the electric drill is in operation. As soon as the polishing stones appear the electric drill should be stopped, the springs tightened and the cleaning tool taken out from the cylinder. Following this, the cylinder should be rinsed, well dried, inspected to see whether the corrosion has been removed and checked for the following:

- if length along which the cylinder was cleaned from the front side is under 250 mm, then it is not necessary to measure the cylinder diameter and it may be re-assembled immediately,
- if the length along which the cylinder was cleaned is over 250 mm, then after cleaning the cylinder diameter should be checked at

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several places and if the cylinder diameter is greater than $\phi 48.25$ mm measured over a length of 400 mm from the front end, then the piston rod head should be replaced. Prior to exchanging, the piston rod head diameter should be adjusted to the cylinder diameter. The difference between the measurements of the smallest diameter of the widened cylinder and diameter of the piston rod head, should be from 0.12 to 0.18 mm.

It is very important that the cleaning of corrosion in the cylinder is performed only with the cradle in the vertical position, because if performed in a horizontal position the shape of the cylinder may become oval.

At each cleaning of the recoil brake cylinder, also the compensator should be checked for corrosion. To clean the corrosion from the compensator it should be disassembled and cleaned with the same cleaning tool. After cleaning the compensator cylinder diameter must not exceed 48.50 mm.

After cleaning of the corrosion with the tool, the recoil cylinder and the compensator should be carefully washed in soapy water and then wiped dry. After this the cylinders should be inspected to make sure there is nothing left in them and then assembled.

Corroded recoil brake piston rod - To inspect the recoil brake piston rod it is necessary to pull back the barrel to its extreme rear position and when it is pulled back for 930 mm, the examination of the piston rod should be made.

If, in examining, it is found that there are only slight traces of corrosion in form of stains, then the cleaning may be effected by rubbing with cork or coarse linen without disassembling of the recoil brake. Care should be given that self recuperation of the barrel does not occur. To safeguard against this, a wooden block should be placed between the cradle and the breechring. The barrel pulling back device should not be released anymore than necessary for pinching the wooden block between the cradle and the breechring.

If the piston rod is corroded over its whole length, then it should be disassembled and ground on the grinding machine.

If the corrosion on the piston rod affected only the place contacting the packing in the stuffing box, then, after disassembling of the recoil brake piston rod, the corroded place should be remedied as follows:

- the corroded surface on the piston rod should be taken off with a lathe,
- if it should be necessary to take off so much material from the piston rod that would reduce the diameter under $\phi 30.50$ mm, then the repairing should be abandoned and the piston rod replaced with a new one,
- after taking off the material the machined place on the piston rod should be de-greased and filled up with tin and then machined to the existing diameter of the piston rod so that the surface is absolutely smooth,
- the tinned portion of the piston rod should be dipped in a 10% solution of ammonia soda for 10 - 15 seconds and the thoroughly washed in hot water.

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If the piston rod corrodes due to lack of fluid, at its front part by the head, then the corroded place should be cleaned with fine emery paper. This is permitted only in cases when the corroded place, measured from the rear portion of the head is not over 30 mm.

If the piston rod on its front part corrodes in length over 30 mm the piston rod should be ground over the whole length provided its diameter is not reduced under 31.75 mm.

It is also necessary to inspect the inside of the piston rod for corrosion, and if found to be corroded in the central hollowness, the corrosion should be removed by means of wooden rod with fine emery paper attached to its end.

After removing of the corrosion, the inside of the piston rod should be well wiped making sure that all residue from emery paper is removed before it is wiped dry.

Defective fluid filling valve-The following defects may appear:

- defective valve jointing,
- defective valve box jointing.

If the fluid leaks along the valve seating, the rubber jointing should be replaced with a new one. Prior to changing the jointing the valve should be disassembled and the valve ball seating cleaned.

If the fluid leakage appears along the valve box threading, remedying should be tried by tightening. If this fails, the valve plug should be unscrewed, the fluid drained from the compensator, the valve box unscrewed and the copper jointing replaced with a new one or the existing jointing, if not damaged, should be heated red dipped in water and screwed on again together with the valve box.

f) REPAIR OF THE RECUPERATOR

The following defects may appear in the recuperator:

- loss of pressure from the recuperator,
- fluid leakage at the rear stuffing box,
- pressing of fluid along the piston head,
- excessive recuperation speed,
- recuperation too slow,
- incomplete recuperation,
- defective recuperation speed regulators,
- defective middle cylinder bulkhead,
- corrosion in the middle cylinder,
- corrosion in the recuperator working cylinder,
- corrosion of the recuperator piston rod.

Loss of pressure from the recuperator - Loss of pressure, from the recuperator may appear because of:

- leakage at the filling valve,
- leakage at the welding,
- leakage at the middle cylinder bulkhead.

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a) Leakage at the filling valve

At the azote filling valve the leakage may appear in most cases through the valve seating or along the valve box. Checking these places for loss of pressure should be performed by smearing the valve box with suds. Appearance of bubbles from the suds will indicate the place of pressure leakage.

If the suds bubbles show up by the valve then tightening of the valve should be tried to stop the leakage.

In case the desired results are not achieved, the valve should be loosened, the pressure from the recuperator released, the valve unscrewed from the valve box and the valve head inspected to see that it is not frozen. If the tapered surface of the valve head is frozen it should be machined smooth or otherwise the valve body replaced with a new one. Prior to replacing the repaired or the new valve, the valve head seat should be examined and if major scratches are found, the valve box ought to be removed from the cradle the rough surfaces eliminated with the scraper and polished with finely powdered emery using the valve for this purpose in order to achieve proper fitting of both tapered surfaces to insure sealing. After polishing, the valve and the valve box should be washed well from any residue, dried and put back in place. After filling the recuperator with azote, a re-check with suds should be made. The pressure should be graged 49 hours later under the same temperature conditions and if the pressure has fallen the cause for the leakage must be found and eliminated.

If bubbles appear on the connection of the valve box with the cradle, then the pressure should be released, the box unscrewed, the copper joint removed and heated red and dipped in water and put back in place or replaced with a new one. After changing of the copper joint, the valve box should be tightened well and then the pressure checked again in the same manner as explained above.

If it should be impossible to repair the defective valve or the valve box, both should be replaced with new ones.

b) Leakage on the welding

When the valve is in good condition and loss of pressure still exists, then the welding on the front bulkhead of the middle cylinder on the upper and lower side should be checked by applying the suds. If bubbles appear, the pressure from the recuperator should be released, the bulkhead, holding the bulkhead, cut away with a cold chisel, the place of welding well cleaned from paint and then re-welded, taking care that it is done according to all rules prevailing for this kind of welding, using electrode having good sealing properties. After welding the cinder from the welded place should be cleaned off and inspected to make sure there are no pores. If the welding is good it should be made homogeneous by hammering. After this the recuperator should be filled to the prescribed pressure and the sealing checked. The pressure should be checked again after 49 hours.

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c) Leakage of pressure at the middle cylinder bulkhead, (figure 74)

If there are no pressure leakages at the filling valve or at the welding by the middle bulkhead, then the cradle should be submerged in water and checked on the bottom side by the compensator spring opening, to see whether bubbles are appearing. If bubbles appear then the pressure should be released, the compensator disassembled and tightening of the bulkhead rubber ring fixed with the wrench. If this should fail to stop the leaking, then the rubber jointing ought to be replaced. If the rubber jointing is struck then the welding should be cut away from top and bottom side of the bulkhead, the middle bulkhead nut unscrewed with a wrench, the pin driven out from the middle bulkhead and the middle bulkhead driven out through the compensator opening.

The rubber ring should be removed from the bulkhead body and the bulkhead body cleaned well. A new rubber ring should be taken according to figure No. 75 and placed on the body, the pushing and belville spring put in place and the nut screwed on by hand without tightening with a wrench. So completed middle bulkhead should be inserted through the compensator opening and pushed into the cylinder so that the hole on the cradle coincides with the hole on the middle bulkhead body. Through these holes the pin should be driven if it is in good condition and if not good a new one should be made having a diameter 12 ± 0.003 mm and 62 mm long. The pin must fit very tightly in the middle bulkhead hole. After driving in the pin, the pin should be welded on the top and bottom side of the cradle. Prior to welding the spot should be degreased and paint free. The quality of the welding should be the same as described under b) above.

After welding, the middle bulkhead nut should be tightened with a wrench according to figure No. 76 as far as it will go, and then the recuperator filled and checked for leakage. If there is no leakage the compensator should be cleaned and attached.

Being that the cradle was submerged in water, the protecting cover from the left cylinder should be unscrewed, wiped clean, dried and greased.

Fluid leakage at the rear stuffing box - If leakage of fluid appears on the rear box of the left cylinder of the recuperator, then the pressure should be released, the pin from the piston rod extension driven out and the extension unscrewed. The stuffing box body should be unscrewed from the cradle and removed from the piston rod. From the front and rear side of the stuffing box the bushing should be unscrewed and the crimped rings removed and the surface of the stuffing box cleaned well especially at the place where the jointings are fitted. Prior to inserting of new rings they should be carefully tested by bending. If the jointing is good it must not show any traces of stale rubber. When fitting new jointings into the stuffing box, care should be taken to make sure the jointings are properly placed so that the edges of the ring are facing toward the corresponding crimped ring as shown in figure No. 66.

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After inserting of rubber rings, on the front side the crimped ring should be screwed on and on the rear side the bushing. Care should be taken not to use such force which could damage the rubber jointing while screwing it on. Tightening of the crimped ring must not be forceful.

The stuffing box must be carefully placed on the piston rod taking care not to damage the edges of the crimped rubber rings. Prior to screwing in the stuffing box the copper jointing of the box should be heated red and dipped in water. The stuffing box should be well tightened with a wrench.

The piston rod extension should be screwed on and secured with the pin.

Passing of fluid along the piston head - If the fluid appears through the protecting cover of the front opening of the recuperator left cylinder, that means the fluid is passing along the recuperator piston head. This is caused by the corrosion in the working cylinder of the recuperator. In cases of fluid leakage, the following should be done:

- releasing of pressure and fluid from the recuperator,
- unscrewing the cover the front opening of the cylinder and the rear stuffing box,
- taking out the recuperator piston rod together with the stuffing box from the cylinder and inspecting the jointings on the piston rod head,
- replacing the damaged rubber jointings with new ones after inspecting them.

Give replacement of jointing inspection of the recuperator working cylinder should be performed, which ought to be cleaned before inspection. If there are corroded surfaces in the cylinder especially at jointing resting places, which could be the cause for leakage, then the cylinder should be cleaned by means of the cleaning tool. During cleaning, the cylinder must not be widened more than 0.3 mm. Abrupt changes in diameter of the cylinder are not allowed.

Prior to starting the cleaning of the interior of the recuperator working cylinder, it is imperative to remove the stuffing box of the repair part of the middle cylinder and protect entrance of contamination into the middle cylinder or otherwise to remove also the floating piston.

The working procedure with the corrosion cleaning tool is outlined in the part concerning the repairs of the hydraulic recoil brake under the heading "Corroded recoil brake cylinder".

After cleaning, the cylinder should be thoroughly washed, wiped, dried and then assembled.

After assembling, the recuperator should be filled with fluid, given its pressure. Artificial recoiling and checking of the sealing should also be carried through.

After checking, the protecting cover should be placed on the front side of the recuperator cylinder.

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Excessive recuperation speed - The excessive barrel recuperating speed is due to:

- improper position of the recuperating speed regulator,
- defective regulator.

Improper position of the barrel recuperating speed regulator - As soon as it is noticed that the barrel returns with a shock, the position of the recuperating speed regulator should be checked and if it is in position „O“ - open, it should be brought to the position „N“ - normal with the wrench. Besides, checking should be made to see whether the indicator fixes regulator in all three positions. If necessary adjusting of the indicator should be made.

DEFECTIVE REGULATOR

Too rapid recuperation of the barrel owing to defective regulator which appears because of accumulated dirt between the contacting surface of the valve or because of defective jointings in the valve body, may be the cause for recuperation of the barrel with a shock. In such case the pressure from the recuperator should be released, the regulator body unscrewed and the dirt from the cylinder removed. When doing this the fluid from the recuperator should be drained and passed through a sieve. If small pieces of jointings are noticed in the fluid while sieving it, then it will be necessary to examine the jointings the floating piston and on the recuperator piston and if necessary, the jointings should be replaced with new ones.

If the jointing on the regulator body is damaged so that it allows leaking of fluid, the jointing should be replaced with a new one.

After assembling, the barrel should be pulled back several times to check whether the repairs are good.

Slow barrel recuperation - If the recuperation is too slow, first it should be checked to see that the recuperation speed regulator is not set in the position „Z“ - closed. If found in this position, it should be turned with a wrench to position „N“ - normal and artificially recoiled. If the recuperation speed does not change, then the pressure should be released, the recuperation speed regulator unscrewed and taken out of the cylinder and the valve inspected. The valve openings should be cleaned, the jointings on the piston rod head and on the floating piston checked and if damaged replaced with new ones.

After assembling the recuperator, the regulator should be put in position „N“ - normal and artificial recoiling of the barrel carried out several times for the purpose of observing the recuperation speed.

Incomplete barrel recuperation - Incomplete barrel recuperation may be caused by insufficient pressure in the recuperator or azote passing over the floating piston or the passing of fluid over the recuperation piston.

If pressure is insufficient it should be added and then checked by means of artificial recoiling, and if again the recuperation is incomplete,

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then the azote and fluid should be released, the recuperator disassembled and the regulator body carefully unscrewed, because it could be that azote and fluid have mixed and by careless handling the pressure may blow the regulator out and cause an accident.

If the pressure is insufficient it should be added and then checked by artificial recoiling of the barrel, and if the barrel recuperation should be still incomplete, mixing of azote with the fluid may be suspected. To determine this, proceed as follows:

- place the manometer in recuperator valve casing,
- take the pressure reading,
- unscrew the plug on the recuperating speed regulator,
- screw on the key for control of air in the fluid so much as to push the valve.

After this leaking of fluid through the valve and the groove on the key will appear. During this leaking the outgoing fluid should be watched to see whether it is foamy what will be an indication that there is azote in the fluid. The fluid will be coming out until the valve body separates from the stuffing box about 3 - 4 mm, after this the flow of fluid should stop.

The movement of the valve body away from the stuffing box is caused by pressing of the floating piston on the regulator shaft. At the moment when the flow stops the floating piston should be removed.

When the piston is pulled out, the fluid which was behind the piston because of damaged jointing should be poured out.

The floating piston should be disassembled, the jointings replaced, the piston assembled again and prior to inserting it the interior of the cylinder ought to be inspected for corrosion. When examining the cylinder lighting equipment according to figure No. 1 should be used.

If the cylinder corroded, its cleaning should be performed by means of the cylinder grinding tool according to figure No. 77. The inside surface should be ground over its whole length. Grinding of the cylinder by means of this tool may be done with a portable electric drill or with a machine.

When grinding, care should be given to obtain uniform increase of the cylinder diameter over its whole length. It is permitted to increase the diameter of the middle cylinder up to $\phi 48.70$ mm, because the standard jointings held in the spares set can still take care of this cylinder diameter.

If, because of damaged jointings on the recuperator piston, the fluid passed over the piston, the repair should be performed in the same manner as explained under the heading "Passing of fluid along the piston head".

Defective recuperation speed regulator - Most frequent defects on the recuperation speed regulator are:

- fluid leaking on the fluid adding valve,
- broken regulator shaft spring,
- bent or broken recuperation speed regulator valve stop.

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If the fluid leaks on the fluid adding valve, the reserve fluid should be released through this valve by means of the azote and fluid control key. Then place a wrench on the recuperating speed regulator head and with another wrench unscrew the fluid adding valve. Remove the valve with the spring and the jointing. Examine the valve and the jointing. After this follow up by replacing of the defective jointing with a new one and assemble.

If the fluid leaks between the shaft and the head of the regulator, the complete regulator should be removed according to afore given instructions, and the regulator head unscrewed, the examination of the tapered portion on the shaft and head of the regulator performed and if defects are revealed these should be eliminated by polishing with fine emery powder. If the defects prove to be such which cannot be remedied by polishing, then the tapered portion of the shaft should be re-ground and the tapered part of the regulator head also cleaned and re-polished. Elimination of this defect requires re-boring of the set screw seating on the shaft. When doing this care should be taken that re-boring of this seating does not exceed the depth of 2 mm.

Notice : After grinding of the regulator shaft and head, the positions of marks „N” (Normal), „O” (open) and „Z” (closed) on the regulator head change. These marks should be destroyed and new ones stamped. When doing this have in mind the fluid sieving valve so that by mark „N” three holes on the valve are open.

The broken spring of the regulator shaft may be easily detected when adding fluid through the fluid adding valve because the spacing between the nut and the regulator body is not being reduced. In this case the pressure from the recuperator should be released and the regulator body unscrewed from the middle cylinder. Then the recuperation speed regulator should be disassembled and the broken or damaged regulator shaft spring taken out. A faultless spring must have a free height of 48 ± 0.5 mm and after compression with a force of 140 ± 10 kg its height should be 43 mm. After inserting of the spare spring the regulator should be assembled as shown in figure No. 65. When screwing the nut on the shaft it is necessary to push the shaft from the front so that it protrudes from the bearing on the rear side of the regulator body.

After complete assembling and filling of the recuperator, the following control should be made:

- releasing of fluid on the fluid adding valve until the spacing of 8 mm is created between the head and the regulator casing,
- with the fluid adding pump enough fluid should be added to make up the prescribed quantity (200 gr). This will make the head fit tight again against the regulator casing,
- several artificial recoils of the barrel should be made and the recuperation observed; after this the proper function of the regulator should be checked. The regulator nut must fit tight against the body and there must not be any moistures from the fluid on the outer surfaces.

If the valve stop of the recuperation speed regulator is broken or bent, the pressure from the recuperator should be released and the regulator unscrewed. The bent or broken screw should be unscrewed and a new one made according to dimensions in figure No. 78. When completely

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screwed-in the screw must rigid. After repairs the regulator should be screwed into the cradle cylinder, well tightened and then given the pressure of 62 atm.

Corrosion in the working cylinder of the recuperator - The corrosion of the internal surface of the recuperator working cylinder mostly appears if the weapon is left without fluid for a longer period of time. The corrosion on the external surface of the cylinder may appear more often especially if it contained moist air instead of azote. The corroded recuperator should be disassembled, the working cylinder unscrewed and carefully cleaned and inspected.

If there are traces of corrosion on the inner surface, the cylinder should be carefully tightened in the lathe with a nolder, and after this, if the corrosion is only slight, the corroded places should be remedied with the cleaning tool. If the cylinder corroded to a greater extent at more places, then the whole cylinder should be ground with the grinding tool, figure No. 77. The inner diameter of the cylinder must not be greater than from 36.40 mm to 36.44 mm.

The external surface of the cylinder may be cleaned from corrosion with emery if only slightly affected and if the corrosion is greater, i.e. deeper than 0.6 mm and if the whole circumference is affected, then such cylinder should be replaced with a new one. If the corrosion is at spots and up to 0.5 mm deep, then such spots should be cleaned on the machine so that all traces of corrosion varnish.

After cleaning of the corrosion on the cylinder must be measured and its diameter must not at the same time exceed the limits determined for the outer dia. under 41.20 mm and the inner dia. over 36.40 mm. After measuring and before assembling the working cylinder, should be well cleaned, the outer surface lightly greased with gun grease, the cylinder inserted into the cradle and screwed-in together with the rubber seal on the end which comes to the rear portion of the cradle. Prior to assembling of the cylinder the copper jointing on the front side of the cradle should be replaced with a new one which must be heated first. When the working cylinder is being fully screwed into the cradle care should be given that it rests properly on the copper jointing because no subsequent tightening is permitted later on. After tightening of the cylinder, the rubber seal should be tightened on the working cylinder from the rear side of the cylinder. This jointing also should be tightened as much as possible. The rubber jointing should be tightened so much as to insure complete sealing, but this must not be overforced because deformation of the working cylinder at that place may occur.

After complete assembling and filling of the recuperator it is necessary to check to see whether the sealing is good. The front of the working cylinder should be checked with soap suds and on the rubber jointing on the rear of the cylinder as follows:

After 48 hours releasing of the pressure in the recuperator should be done and then on the fluid adding valve in the recuperator by means of the pressure in the fluid control tool some fluid ought to be released and watched that the fluid is not coming out under pressures but dripping freely. If the fluid is coming out under pressure, it means that the sealing is not good and that it is necessary to tighten the nut which is pressing the rubber jointing.

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Corrosion of the recuperator piston rod - The recuperator piston rod in most cases corrodes at the place of contact with the jointings and owing to this leakage of fluid may appear. If the fluid leaks along the piston rod, then artificial pulling back of the barrel for at least 15 cm should be made as to make it possible to inspect the piston rod.

If the piston rod is effected by corrosion, the pressure and fluid should be released from the recuperator and the piston rod taken out from the cradle and disassembled. Slightly corroded places may be ground off on the machine. The permitted layer of material that may be taken off by grinding is up to 0.25 mm and this should be done evenly over the whole length of the piston rod and not only in places.

When the piston rod is more seriously effected by corrosion at the place of contact with jointings, then machining may be carried out on a lathe by cutting grooves of corresponding width provided that at such places the diameter is not reduced under $\phi 14.5$ mm. The edges of the grooves must not be sharp but rounded. The grooves must be cleaned from grease and filled with tin and then the repaired places should be machined even with the diameter of the unaffected portion of the piston rod. After machining of the piston rod the repaired places should be submerged in a 10% solution of ammonia soda for 10 - 15 seconds and then washed in hot water and dried. In this manner repaired piston rod should be assembled in the recuperator.

F. CHARACTERISTICAL REPAIRS

In this part instructions are given for performing of those repairs for which it is necessary to apply a determined procedure which is hereinafter described.

As characteristical repairs of weapons are considered:

1. repair of the spring device (for E-1 and B1A2),
2. repair of the wheel,
3. repair of the trails,
4. repair of the barrel connector with the hydraulic recoil brake and the recuperator,
5. repair of the equilibrator,
6. repair of the muzzle brake,
7. changing of slides on the mantle.

1. REPAIR OF THE SPRING DEVICE

Weapons of 76 mm M.48 B-1 are equipped with spring devices having springs type Archimedes screw (figure 73) and weapons of 76 mm M.48 B1A2 and M.48 B1A1 are equipped with spring devices having cylindrical winding spring (figure 83).

a) SPRING DEVICE OF THE 76 mm M.48 B-1 GUN

Disassembling of the spring device:

- place a wooden block under the axle and lift the wheel off the ground of which the spring device is being disassembled,
- turn the wing of the fastener backward,
- remove the wheel and the spring device from the axle,
- to disengage the spring device box from the wheel, proceed as follows:
 - remove the cotter pin from the nut of the spring device shaft,
 - unscrew the nut and remove the washer,
 - unscrew the spring device from the semi-axle,
 - to take out the spring device shaft, proceed as follows:
 - unscrew the nut set screw,
 - with a socket wrench unscrew the nut fastening the shaft to the spring device box,
 - with a scissors wrench unscrew the box cover,
 - take out the shaft,

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- take out the spring from the spring device by driving out the spring through the opening which is closed with lead.
- to remove the fastening bolt of the spring device box on the semi-circle proceed as follows:
- take out the cover pin with the bolt key.
- unscrew the pin.
- remove the spring washer.
- pull out the bolt upward.
- take out the spring device lock pin after the stop screw is unscrewed.

When assembling the spring devices care should be taken that each spring device will fit into its seat on the corresponding side of the gun.

- by spring device the following defects may be encountered:
- breaking of the spring.
- wear of bronze bushings of the spring device.
- defective spring device lock bolt.

Breaking of the spring - When the spring breaks the spring device should be disassembled as explained above and the new spring placed in the spring device box. It should be borne in mind that section of the bent end of the spring may not have any way because otherwise premature breaking of the spring may result. When necessary the bent end of the spring should be hardened with acetone. After repairing of the spring the spring device should be assembled.

Replacing of bronze bushings of the spring device - When the bronze bushings wear over their diameter and when inclination of the wheel is noticed their replacement of the bronze bushings should be performed as follows:

- disassembling the spring device and the diameters of the bronze bushings.
- driving out the worn bushing from its seating and making a new bushing according to dimensions shown in figure 80.
- pressing the new bushing into the seating and making the hole for passage of the lubricant.
- checking proper fitting of the shaft and if necessary lubricating the surfaces with the scraper and after cleaning from the remains of material the spring device should be assembled.

Defective spring device locking bolt - If the lock bolt of the spring device moves with difficulty, then the bolt stop should be unscrewed, the bolt taken out from its seat and the bruised places scraped and polished. If necessary the bolt stop screw should be replaced.

If the spring device lock bolt is most owing to self hardening of the stop screw, then a new bolt should be made according to dimensions in figures 81 and 82. When making the bolt, attention should be given when starting the groove in order to obtain the proper

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of the bolt handgrip when assembling. After assembling of the newly made bolt, the movement of the bolt and the position of the handgrip should be checked.

b) THE SPRING DEVICE OF THE GUN 76 mm M. 48 B1A2
AND M. 48 B1A11

Disassembling of the spring device - To disassemble the spring device, proceed as follows:

- place a wooden block under the axle and lift the wheel off the ground of which the spring device is being disassembled,
- unscrew the front and rear cover of the spring box to enable the spring to expand; prior to this the safety elements should be unscrewed from the spring device box;
- turn the wing of the fastener backward,
- remove the wheel and the spring device from the axle,
- disengage the spring device from the wheel, for what it is necessary to:
- unscrew the front and rear cover from the box,
- take out the spring and the spring guide from the box,
- take out the cotter pin from the nut on the box which holds the semi-axle,
- unscrew the nut and pull out the semi-axle from the box seat together with the wheel and from the spring device box take out the pusher which has fallen off the end of the semi-axle,
- from the front box take out the spring device washer and the two part spherical bronze seat,
- from the front cover take out the felt wiper,
- from the rear cover pull out the rubber bumper if necessary owing to wear of the rubber.

To disassemble the fastener of the spring device, proceed as follows:

- drive out the pin from the fastener nut and unscrew the nut,
- remove the spring washer from the fastener shaft and pull out the spring device fastener,

To disassemble the spring device lock bolt, proceed as follows:

- unscrew the stop screw from the bolt seat and pull out the bolt,
- from bolt, if necessary, take out the semi-round roller fastener with its spring.

By spring devices the following defects may be encountered:

- breaking of the spring,
- wear of bronze bearings of the spring device,
- friction in the pusher connection with the spring device shaft.

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Breaking of the spring - When the spring breaks the spring device should be disassembled and the spring replaced; if no spare spring is available, temporary solution may be in turning around the existing spring. When attaching the rear cover with the rubber bumper, the cover should be screwed until the surfaces become flush level if the cover is not properly screwed, the spring device may get overloaded.

If the cracking of the spring is not noticed immediately after happening and the gun runs for a certain period of time with the spring broken, the broken parts may damage some of the inner surfaces and therefore the interior of the spring device should be inspected and all the damaged places remedied.

During assembling, the rubber bumper should also be checked and if saggings of over 6 mm from the basic surface are found, the rubber bumper ought to be replaced.

Replacing of bronze bearings of the spring device - When the bronze bushings wear over 0.7 mm in diameter and when inclination of the wheel is noticed, then replacement of the bronze bushings should be performed as follows by:

- disassembling the spring device and measuring the diameter of the bronze bushings,
- driving out the worn bushing from its seating and making a new one to dimensions shown in figure 84,
- pressing the new bushing into the seating and making the hole for passage of the lubricant,
- checking proper fitting of the shaft and, if necessary, touching up the surfaces with the scraper and cleaning them.

When making new bushings care should be taken that the initial play between the shaft and the bronze bushing is minimum, i.e. that the shaft revolves in the bearing uniformly without jarring. If the initial plays are greater, the bronze bushings will wear much quicker.

Friction in the connection of the pusher with the spring device shaft - During disassembling of the spring device the connection of the pusher with shaft should be checked to see that there is no friction. If there are traces of undue friction, these should be polished off with a semi-round stone as well as the semi-round surface on the shaft. The stone should be used owing to the hardened surfaces. When polishing with stones, check the fitting of contacting surfaces by using minium. Inasmuch as the fitting is better the chances of undue friction are smaller.

2. REPAIRING OF THE WHEEL

The guns 76 mm M-48 E-1 and 76 mm M. 48 B1A11 are equipped with wheels having pneumatic tyres and the guns 76 mm M-48 B-1 A-2 are equipped with wheels having solid semi-elastic rubber tyres. With each type of the wheel an appropriate spring device is provided as indicated under the section of „Repairing of Spring Devices“.

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The wheel with a pneumatic tyre type B-1 A-1-1 (figure 85) differentiates in method of mounting from the wheel with a pneumatic tyre type B-1. Besides this, the wheel type B-1 A-1-1 may be built in only with the spring device B-1 A2, and it differentiates from other two wheel types, and therefore attention should be paid to the following:

- the interior of the hub and method of removing the wheel and the axle is the same as by wheels with ~~solid~~ tyres B-1A2 (figure 86). Removing of the wheel off the semi-axle is done in the same order and in the manner as described, for the wheel with a solid tyre type B-1A2,

- the wheel itself - rim - is fixed to the hub with bolts in the same manner as by the pneumatic tyre wheel B-1 (figure 85A). Removing of the wheel - separating it from the hub, as well as removing, repairing and fixing the tyres is done in the manner described for the pneumatic wheel type B-1.

a) THE WHEEL OF THE GUN 76 mm M-48 B-1 (FIG. 85A)

Disassembling of the wheel - The disassembling of the wheel is being performed as follows:

1. To remove the semi-axle off the wheel proceed as follows:

- unscrew the safety screw from the wheel fastener on the semi-axle (on outer side of the wheel),
- unscrew the wheel fastener on the semi-axle with the scissors wrench,
- lay down the wheel on the outer side, remove the bronze ring fastener and with the scissors wrench unscrew the bronze ring, while doing this hammer the semi-axle with a wooden hammer at intervals.

2. Remove the smaller ring with the roller bearing by tapping with a copper hammer until it falls off the ~~axle~~ rim.

3. To remove the large ring with the roller bearing proceed as follows:

- unscrew the fastening screw from the inner ring,
- unscrew the inner ring with the scissors wrench.

4. To remove the spring device, lock proceed as follows:

- unscrew the screw,
- remove the plug with the spring,

5. Unscrew the fastening screw and remove the rubber buffer.

6. To remove the wheel it is necessary to:

- unscrew the wheel fastener safety screw on the semi-axle,
- unscrew the fastener, and
- remove the wheel.

By this wheel only defects of the rubber tube and the tyre may be encountered.

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The tyres are subject to injuries from cuts, dents and chock on the road. Travelling with defective tyres is dangerous because at any moment the tyres may explode and this would cause other damages.

After each travelling the tyres should be carefully checked. Glass, nails, stones and other matter that gets stuck in the tyres should be removed.

When damaging of the occur adhere to the following:

- change the tyre if the extent of the cut has reached or injured the ply,
- the swollen spot on the tyre indicates that its interior is damaged. In such case the tyre should be changed and also if the plying is damaged,
- small cuts on the tyre shoe which have not reached or gone into the plying are not a reason for changing tyres, but such should command close watching,
- big cuts by which it is almost evident that plying is exposed to further injuries, may be a good reason for changing the tyre,
- in the event the wear of the tyres is uneven owing to inclination of the wheels, and sharp or fan shaped edges appear, the tyres should be interchanged and inclination of the wheels eliminated by changing the bronze bearings.

When the shoe wears to an extent that the tyre gets smooth in the middle, it should be changed. Such tyres should be re-conditioned by vulcanization.

It will not be possible to vulcanize the tyres on which the wear of the rubber reached the plying.

The pressure in pneumatics should be periodically checked and maintained at its standard of 2.75 atm. When checking the pressure, the valve should also be checked for leakage of air. For determining the pressure an accurate gauge should be used always. This gauge should be periodically checked with the control manometer.

Never should the pressure in the tyres be determined by visual estimation or by kicking the tyre. The pressure should be checked only when the tyres are cool.

Removing the tyre from the wheel - To remove the tyre from the wheel, proceed as follows:

- unscrew the nuts which tie the hub to the wheel disc and separate the wheel from the hub,
- release the air from the tube,
- by means of the accessories for expending the tyre, remove the tyre edge from its seating on the rim of the wheel, taking care not to damage the tube,
- take out the tube, taking care not to damage the air valve body while pulling the tube out.

For pulling out the tube from the tyre, sharp objects must not be used.

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Small punctures on the tube may be repaired with rubber patching tools which are located in the „Spares, accessories and tools set“ of the gun.

Seriously damaged tube should be replaced with a new one.

Mounting of the tyre on the wheel - When mounting tyres on the wheel adhere to the following:

- by means of the tyre bar from the „Spares, accessories and tools set“ of the gun, get the edge of the tyre over the wheel rim,
- for easier fixing smear the tyre edges with soap,
- insert the tube into the tyre, taking care that it does not crease and that the air valve coincides with hole on the wheel rim,
- pull the air valve through the hole on the wheel rim,
- put some air into the tube and release it several times so that tube may find its proper place in the tyre,
- with the tyre bar get the second edge of the tyre on the wheel rim, making sure it fits properly in the rim,
- fill the tyre with air up to the standard pressure and put the cap on the valve,
- place the wheel on the hub and tighten with nuts.

b) THE WHEEL OF THE GUN 76 mm M - 48 B-1 A-2 (fig. 86)

Removing of the wheel - To remove the wheel it is necessary to:

- unscrew the safety screw from the outer side of the hub and use the wrench to unscrew the hub cover,
- remove the cotter pin from the semi-axle nut,
- unscrew the semi-axle nut,
- by light tapping pull out the wheel and the semi-axle,
- unscrew the safety element from the bronze ring and unscrew the bronze ring from the inner side of the hub,
- drive out the outer rings of the roller bearings from the hub with a piece of hard wood.

If it should be necessary to disassemble the hub cover, proceed as follows:

- from the seating on the face of the cover nut take out the safety element of the nut,
- unscrew the nut and remove the rope ring.

Mounting of the wheel - To mount the wheel reverse the above procedure, paying attention to the following:

- prior to placing the roller bearings in the wheel, they should be first well washed and dried and then checked to make sure that the rollers are not damaged; if there are damaged rollers, the bearing should be replaced,
- the faultless bearings should be greased with bearing grease applying the grease by hand to fill up every hollow space in the

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bearing; with bearings so greased no additional grease should be put into the hub because the grease in the bearings would be sufficient until the next regular greasing,

- make sure that the bearings are well protected from getting dirty before they are placed into the hub,
- do not use great force to insert the bearings into the hub as to avoid damaging of the bearing ring edges,
- replace the felt sealing on the felt holder if too worn; prior to inserting, it should be saturated in spindle oil,
- when attaching the wheels on the semi-axle, make sure that left wheel is on the left side and the right side of the gun viewed in the direction of travel,
- after mounting of the wheel and tightening of the bearing with the nut, loosen the nut slightly and check the rotating of the wheel and then insert the cotter pin in the nut,
- properly mounted wheel must not have any play on the semi-axle and must not rock.

The wheel defects - The defects on the wheel may show up on the metal portion or on the tyre.

On the wheel: If the loading ring should fall out of the seating on the wheel body, it ought to be replaced with a spare one or a new made according to dimensions shown in figure 87. If the seating of the loading ring on the wheel is too worn, it should be enlarged to $\phi 12.50 - 12.53$ mm and small steel bushing forced into it. The outer diameter of the bushing should be $\phi 12.52$ mm, and the inner diameter within the limits of 10.30 to 10.50 mm, and the length ought to be 12 mm. After pressing in of the bushing the loading ring should be attached and tightened with the nut under which a spring washer is firstly placed. After checking that the loading ring may be rotated freely in 1st seating, the nut should be secured in order not to get loosened when riveting the end of the screw.

The tyre on the wheel wears in time so much that the skidding preventing grooves totally disappear. When the diameter of the tyre is reduced to 630 mm, the wheel should be sent to the shop for the purpose of removing the old and attaching the new type.

Replacing of the old tyre with a new one should be done also when big pieces are broken off owing to mechanical injuries or aging of the rubber. The tyres age much quicker if the wheels are not protected against sun rays when not in use.

Under conditions of proper care of stored wheels, the tyres should be re-newed every 15 years from the date of manufacture regardless whether the tyres were used or not in the meantime. Owing to the influence of high temperatures, severe cold weather, sun rays, contamination or lubricating oil, the life of the tyre may be shorter.

Prior to sending the wheels to the factory for the purpose of attaching new tyres, the metal parts of the wheels should be checked. If the wheels are deformed it shall not be possible to renew the tyres because the wheel will not fit in the vulcanizing mould. Checked the metal portion of the wheel as follows:

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- check to see that there are no cracks on the metal part of the wheel,
- the tapered surfaces on the rim of the wheel must not be injured and if injuries do exist they should be eliminated by filling or by machining on the lathe,
- check the alignment of the wheel by rotating it on an axis between center points according to figure 88,
- if found that the wheel is deformed up to 2 mm, then it should be machined on a lathe, held centered between center points, as shown in figure 88,
- if the deformation of the wheel is greater than 2 mm, the wheel must be discarded because on such wheels renewing of the tyre will not be possible.

3. REPAIRING OF TRAILS

By trails the following defects may appear:

- a) loose trails in march position,
- b) defective trails connection,
- c) breaking off of the bolt head,
- d) defective trails fastener in fire position.

a) If the trails in march position are loose, they must be repaired otherwise knocking of parts will result. To eliminate this the rear trails connection should be repaired as shown in figure 95, following by welding on this spot the part as shown in figure 95.

The welding must be well done on all joints and then finished to make proper assembling possible. The contacting surfaces on the rear part of the front trail should be repaired by welding on and then finished as shown in figure 95.

After completing the repairs, assembling the trails for march position and then for fire position should be checked. Easiness of assembling must not be reduced by these repairs.

b) If the connector is defective and it is impossible to fix the trails for the march, checked to see that the connector body is not bent. If it is bent, an attempt should be made to straighten it without removing it from the trails by using a strong bar. In the contrary, disassemble the connector and straighten it without heating and then adjust by filling if it should be necessary.

c) If the bolt head is broken off, smoothen the bolt upper end surface; by removing all of the old welding; this applies to the bolt head too. Weld on the head on the bolt as follows: Heat the bolt and the bolt head on temperature of 150°C, joint the bolt with a thin electrode ϕ 2 mm „Galeb 70“ and clean the welding good and then make further one or two seams with electrode ϕ 4 mm. The

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electrodes which are to be used for welding should be completely dry and therefore prior to using, the electrodes ought to be dried at a temperature of 300°C at least for one hour.

d) If breaking of trails fastener occurs in fire position, then it should be replaced with a spare fastener or a new one made according to the sample.

To bend the trails fastener handle, heat to 900 - 1000°C and bend in hot condition.

To remove the broken fastener, proceed as follows:

- remove the stop screw safety element,
- unscrew the stop screw,
- remove the trails fastener by pulling up.

After making a new fastener, assemble and check functioning of spreading out and closing of trails and if necessary smoothen the surfaces.

4. REPAIRING OF THE BARREL COUPLINGS WITH THE HYDRAULIC RECOIL BRAKE AND THE RECUPERATOR

If the coupling is not in good order and does not tie the barrel with the piston rods firmly, then during firing the recoiling parts may move freely backward and cause undesirable consequences. Therefore the strength of the coupling handle spring must securely hold the handle in the seating when the barrel is connected with the piston rods. If this is not the case, then the spring should be replaced with a spare or a new one made according to figure No.69.

After changing of the spring the firmness of the connection should be checked.

It must be mentioned that the coupling disjoins most frequently during recuperation of the barrel, and especially if the recuperation is too fast and the springs weakened.

5. REPAIRING OF THE EQUILIBRATOR

By equilibrators the following defects may appear:

- uneven functioning,
- defective steel wire rope of the equilibrator.

Uneven functioning of the equilibrator (figure 89). - The uneven functioning of the equilibrator may be caused by weakening of the equilibrator spring or pulling out of the steelwire rope from its seating. If the equilibrator spring has weakened, then at great elevations of the barrel it will be felt that the elevation mechanism is working with difficulty. In such cases the cradle should be removed and, from the front side, the strength of the spring adjusted with a wrench, the cradle replaced again and functioning of the barrel elevation mechanism tried. If after adjustment, the standard force on the handle of the mechanism is obtained at great elevations of the barrel and functioning of the mechanism

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with difficulties at depressions, then the spring has weakened to the extent that it should be replaced with a spare one.

Notice: Disassembling of the equilibrator should be done only by means of the special tool from the „Battery Set of Spares, tools and accessories“.

After replacement of the spring, the functioning of the elevation mechanism should be checked and if necessary adjustment of the equilibrator spring made so that the mechanism works uniformly both at great elevations and depressions.

Defective steelwire rope of the equilibrator - If the steelwire rope of the equilibrator stretches, functioning of the barrel elevation mechanism will be difficult. In such cases the lengths of the equilibrator springs should be checked and if these are not shorter than 380 mm, then the equilibrator steelwire rope ought to be checked to see that it did not get pulled out from the head in which it is cast. The cast places in the head should be examined and if the steelwire rope is partly pulled out, then the mixture of lead and tin 50:50 with which the steelwire rope is cast into the head should be melted and the knots on the rope inspected to see whether they are in good order. If the knots are not in good order, the steelwire rope should be taken out from its seating and new sailor's knots made on the stems and the rope cast again with the above mixture; however, prior to casting, the steelwire rope should be pulled tight.

The proper length of the steelwire rope measured between the heads should be from 370 to 385 mm.

If the steelwire rope is longer, the working of the equilibrator should be tried by adjusting with the nut and if the steelwire rope has stretched too much then the mixture from the head ought to be melted and steel washer placed under the knot and the rope cast.

When there are broken wires in the rope it should be replaced with a spare one.

Care should be taken to have the steel wire rope always well greased and special attention ought to be paid that the rope is not damaged by corrosion and that it is lubricated by dipping in oil prior to replacing.

6. REPAIRING OF THE MUZZLE BRAKE, (figure 90)

By the muzzle brake, owing to powder gases stress, the discs may bend. A check of this should be made every time after firing of a larger number of rounds, because the edges of the material may bend and reduce play between the projectile and the opening of the brake.

If the discs of the brake sustain serious bends, the muzzle brake should be unscrewed from the barrel mantle, removing firstly the safety screws.

The muzzle brake should then be fastened in the lathe and centered and the inner diameter of the disc machined to 92.5 mm on all discs. Following this the radius of $r=3$ mm, should be machined on all discs with a pattern cutter (figure 90). Then the muzzle brake should be

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screwed into the barrel mantle again and fastened on both sides (figure 94), taking care that it is screwed on so much that the fastening screws enter the seatings of the muzzle brake and that the marks for the reticle pattern cross are in proper position.

7. CHANGING OF SLIDES ON THE MANTLE

The slides should be replaced when they wear off in width over 162.5 mm.

To replace the slides, proceed as follows:

- find and mark the screw spots which hold the slides to the mantle,
- cut in the screws, the screwdriver recess and unscrew the screws,
- drive out the worn slides under a press, and if a press is not available then reduce their thickness with a machine and drive out,
- machine the outer surfaces of the new slides definitively so that they may be pressed into the seatings on the mantle and the inner surfaces should be machined only roughly, according to figures 91 and 92,
- drive in the finished slides into their seatings with a hammer but bear in mind that the slides must be within the prescribed tolerances and greased because, otherwise, driving of the slides may cause cracking of the mantle,
- after pressing in of the slides, drill new holes in the mantle and screw in tightly the brass screws according to figure 93 and cut off the screw heads,
- place the mantle in the machine for the purpose of giving the slides the final finishing,
- when placing the mantle in the machine make sure that the slides are parallel with the mantle axis both horizontally and vertically,
- after machining, place the mantle with the new slides on the cradle and check the possibility of assembling with the muzzle brake, the barrel, the breeching and the cradle,
- if necessary, adjust the bronze slides with the scraper,
- after fitting of the slides with the cradle drill holes in the slides $\phi 47$, but prior to doing this remove the lubricating cups from the mantle,
- with a semi-round cold chisel 4 mm wide, make a zigzag groove for lubricating the surface contacting the cradle; this groove should pass over the lubricating cups holes,
- clean well the slides and lubricating cup holes from residue matter,
- place the lubricating cups in the mantle (figure 94),
- check the quadrant level plates on the breeching and if necessary adjust so that the digressions do not exceed 1%,
- perform the artificial recoiling of the barrel.

G. THE FINAL INSPECTION AND CONTROL AFTER REPAIRS

After completion of repairs on the gun it is obligatory to perform the final inspection in order to check the quality of the work done. The results of this inspection are entered in the special report which is being kept as a document concerning the performed repairs.

The inspection report should include the following:

- the title of the organisation which made the repairs,
- the date of repairs performed,
- the number of the gun repaired,
- type of repairs, parts or assemblies of the gun,
- the condition found during inspection,
- what gaugings and adjustments were made during this inspection,
- behavior of the gun during firing.

If also firing of the gun is prescribed for checking the repairs, then prior to signing of the report, the behaviour of the gun during firing is entered and also the condition during the inspection after firing.

a) THE PROCEDURE DURING THE FINAL INSPECTION

The final inspection of the repaired gun should be reformed on a level platform. Aside of the general inspection should be given to:

- the completeness of the gun and the belonging „Spares, accessories and tools set”,
- checking the connection of the barrel with the breeching, mantle and the muzzle brake connection with the mantle,
- checking the condition of barrel bore and comparing the condition of the barrel with the condition entered in the gun log book,
- measuring of the forcing cone depth and entering it in the gun log book,
- checking of the breechblock functioning by opening and closing it several times,
- firing the primer in an empty cartridge case,
- separating the recoiling system from hydraulic brake and pulling it back and pushing forward and observing the work of the semi-automatic,
- checking the work of traversing and elevating mechanisms of the barrel; the force required to move the traversing and elevating mechanisms cranks must not be greater than 4 kg and 3 kg respectively,
- checking the play in the barrel traversing and elevating mechanisms; it must not be greater than 1/4 turn of the circle,

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- by giving elevation check the functioning of the recoil length regulator
- check the possibility of connecting and disconnecting of the spring devices,
- by giving the elevation and depression, test the functioning of the equilibrators,
- at barrel depression check the possibility of disconnecting of the equilibrators,
- check the easiness of disassembling of the gun in pack loads and assembling,
- check to see whether the wheels are mutually parallel both in horizontal and vertical levels,
- check the easiness of connecting the front and rear trail of the carriage,
- check the fixing of the shields,
- check the stuffing box and the pressure in the recuperator and then pull back the gun several times
- perform the rectification of the sighting devices.

b) ARTIFICIAL RECOILING

The artificial recoiling of the barrel should be performed after each repair of the hydraulic brake and the recuperator or repair of other assemblies for which this is especially emphasized. The artificial recoiling should be performed with at least three pullings back if not prescribed otherwise for individual repairs.

Aside from this the hydraulic brake and the recuperator of this gun should be artificially recoiled every month if no firing of the gun was performed during this period of time

The hydraulic brake and the recuperator have relatively finely machined interior surfaces, which are subject to damaging if not in use. The most critical factors which cause slow deterioration of the material is the corrosive effect of the jointings which are dry or having a sour casting of fluid on them. During a longer period of idleness of the weapon, due to the effect of the fluid the jointings may create a sour reaction on their surface which has a very corrosive effect especially at contacting places with the cylinder or the piston rod. By moving the piston rod and the floating piston this acid is being eliminated with the establishing of a fresh coat fluid on the jointings. This movement is in fact the so called artificial recoiling. By artificial recoiling bathing of the jointings and the recoiling parts with the fluid is being performed and thereby the possibility of appearance of corrosion is eliminated, because the fluid cancels the acid created at the place of sealing.

The forces required for performing artificial recoilings are as follows:

- at the start of recoiling the necessary force is 500 kgf,
- at the end of recoiling after drawing out of the hydraulic brake piston rod to 800 mm, the necessary force is 800 kgf.

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The artificial recoiling is performed with a barrel pulling back device or in emergency by man power.

For the purpose of proving the work of the semi-automatic of the hydraulic recoil brake and the recuperator it is necessary to perform artificial recoiling of the barrel under elevation of 0° and 45°.

Prior to starting the artificial recoiling of the barrel, make sure that all surfaces are dried and that there are no traces of fluid; the same should be done after completion of the artificial recoiling.

When recoiling under 0°, an empty cartridge case should be inserted in barrel and the work of the semi-automatic observed during recuperation.

c) TEST FIRING

For each individual case the instructions hereinafter prescribe whether firing should be carried out after repairs and under what conditions to perform the firing.

Prior to firing a detailed inspection of the weapon should be made, as stipulated under G a/ and also artificial recoiling of the weapon should be performed before firing.

Firing should be performed after the following repairs:

1. - After changing of the hydraulic brake piston rod head, the firing should be performed with one round each under barrel elevation of 0° and 45°, using the number four propellant charge.
2. - After complete disassembling of the hydraulic brake and the recuperator for the purpose of cleaning or repairing, the firing should be performed with one round each under barrel elevation of 0° and 45° using the number four propellant charge.
3. - After changing any rubber chaped jointing in the hydraulic brake and in the recuperator, one round should be fired using the number four propellant charge under barrel elevation at choice.
4. - After reducing the diameter of the piston rod or the cylinder to minimum dimensions, prescribed in these instructions under E and in cases when by repairing some of the vital elements of the weapon the conclusion is reached that the resistance of these parts is reduced, the firing should be performed as follows:
 - one round using the propellant charge number four under elevation 0°,
 - one round with overpressure propellant charge (Pm=2100 kg/cm),
 - one round using the propellant charge number four under elevation 0°.

If a major repair on the trails was performed, then above firings should be performed under elevation of 45°.

The weapon which is being used for firing should be placed on hard ground whenever possible and spades must be well rammed into the ground. When necessary the trails ends should be rested against a beam as to obtain a minimum movement of the weapon during firing.

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The firing should be performed with inert shells if possible; however, when firing with overpressure this is obligatory.

The function of the weapon should be observed from the shelter during each round fired. After each fired round the recoil length should be checked, which must be within the limits described in the hydraulic recoil brake regulating instruction. A check for any fluid leaks on the stuffing boxes or any other difficulties should be made.

After completion of firing, artificial recoiling should be performed for the purpose of observing the barrel recuperation which must be smooth without interruptions or knocks.

After completion of firing the sighting devices and the function of traversing and elevating mechanisms should be checked.

The barrels of the repaired weapons should be cleaned and washed after firing in soapy water. In case when such weapons are to be stored or transported over a long distance, at least three days after washing, the barrel should be subjected to standard cleaning once more and then definitively greased.

H. THE HYDRAULIC RECOIL BRAKE REGULATING INSTRUCTIONS

The hydraulic brake assures the prescribed barrel recoil length if it is properly regulated, i.e. if the parts are properly assembled and if the prescribed basic position is achieved.

The hydraulic brake is provided with a counter piston rod of 24 mm diameter with four longitudinal grooves set in cross position. Two mutually opposite grooves are 6 mm wide, and the other two are 4 mm wide. The narrower grooves are mutually equal in length and are shorter than the other two with wider grooves. The narrow grooves determine the short recoil lengths at elevations of 40° and up. The two wider grooves of unequal lengths are layed out up and down.

When the weapon is properly assembled at the elevation of 0°, the longer groove (895 mm) must be located on the upper side of the counter piston rod and in line with the hole on the piston rod head.

The counter piston rod is located in the hollow of the piston rod. The flow of fluid which is located around the piston rod is effected through four holes on the piston rod head and through the counter piston rod groove. The position of the piston rod head and the relation of counter piston rod grooves at the elevation of 0° is shown in figure 96. In this position all fluid flowing holes on the piston rod head are open. The piston rod, i. e. the piston rod head are stationary during taking of elevations or regulating.

The counter piston rod is located in its casing (fig. 59 and 70) and on its outer end a gear sector is attached. The bevel gear sector of the counter piston rod is intergeared with the bevel gear section which is fixed on the front right side of the cradle and forms a unit with one gear which is intergeared with the geared portion of the recoil length regulator rod.

The recoil length regulator rod is made in two parts connected with a nut having double threading, one clock-wise and one anti-clockwise twist, so that the length of the rod may be changed by turning the nut. The other end of the rod carries a small wheel, which slides in the cam groove which is fixed on the top carriage. The curve of the cam is made so that it moves the rod during giving the barrel elevations from 10° to 40°, while on greater or smaller elevations the rod stands still. By moving the rod by means of the gears and bevel geared sectors, the counter piston rod is being rotated. By rotating the counter piston rod the position of its grooves is being changed in relation to the stationary fluid flow holes on the piston rod head. At elevations from 40° to 45° the position of the grooves in relation to the holes on the piston rod head must be as shown in figure 96. At this position of the counter piston rod grooves, the fluid flowing holes from the top and bottom of the piston rod head are closed and flowing of fluid is possible only through the hole on the side and the narrower and shorter grooves. This fluid flowing takes place only up to the moment when, owing to recoiling, the piston rod head passes these short grooves, after what all fluid flowing holes are closed.

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In order to achieve such position of the counter piston rod in relation to the elevation corresponding to fig. 48 and fig. 70, then during assembling the procedure must be as follows:

- the piston rod must be attached so that the symmetric of the smallest fluid flowing hole from the top side coincides with the axis on the piston rod extension, provided that the counter piston rod is firstly inserted into the hollow of the piston rod.

- the counter piston rod should be faced so that the symmetric of the counter piston rod longest groove coincides with the symmetric of the smallest fluid flowing hole on the top of the piston rod head. In this case the side edges of the hole on the head shall coincide with the edges of the longest groove.

In order to assure these positions during further assembly, the adjustments through the top hole on the head of steel of 100% steel having dimensions and profile corresponding to this hole should be inserted as an auxiliary tool. This profiled piece should enter with its width also into the longest groove of the counter piston rod. In this manner the counter piston rod will be kept from rotating.

- So assembly, piston rod and counter piston rod should be inserted into the hollow of the cylinder after the gear stuffing box of the hydraulic brake has been already attached to the piston rod.

- The top stuffing box should be attached to the top half way of the threading and the piston rod rotated until the piston rod extension hole comes from the top side so as to enable putting on the piston rod connector. By means of this connector the correct position of the piston rod head is determined according to fluid flowing holes.

- On the top toothed portion of the counter piston rod the geared sector should be put on. Taking care that the mark on the counter piston rod coincides with the mark on the teeth of the geared sector. During adjustment, the teeth of the counter piston rod geared sector must interconnect with the gear teeth on the side of the cradle so that the tooth bearing the mark "OFF" comes between two teeth bearing the marks "ON". When necessary the tooth of the sector on the side of the cradle should be brought to position which would enable their easy interconnection by turning the nut or the screw length regulating rod in the desired direction. This adjustment should be performed until it becomes possible to achieve complete interconnection of the teeth easily.

- when the teeth of both geared sectors are interconnected, then the regulating nut should be fixed by means of lock nuts on both sides and secured with safety elements.

- after this the geared sector should be removed from the counter piston rod and the piston rod with the counter piston rod drawn out of the cylinder in order to remove the profiled auxiliary tool from the piston rod head which was inserted to keep the basic position of the counter piston rod.

- after removal of the auxiliary tool, standard assembling of hydraulic brake parts may be started, except in case when the cam on the top carriage had to be replaced with a new one due to its defect. In such case, after regulating under elevation of 0° and removing the auxiliary tool from the piston rod head, checking the functioning of the

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After completion of adjustments it is not necessary to check the barrel recoil length at all elevations; checking under elevations of 0° and 40° or 45° would be sufficient.

If the recoil lengths do not correspond to the above values owing to worn parts, the adjustment may be made, i.e. shortening of the recoil on the spot. In such case the lock nuts on the rod should be loosened and the nut on the rod turned so that turning of the counter piston rod to left is achieved (when looking in the firing direction). For the purpose of shortening the recoil length the rod may be moved maximum 2 mm because by moving it over 2 mm the recoil length would be greater at greater elevations.

If after moving the regulator rod for 2 mm. the recoil length is not brought within the above limits, then the worn out piston rod head should be replaced with the spare head along with the necessary work prescribed in section E.

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After completion of adjustments it is not necessary to check the barrel recoil length at all elevations; checking under elevations of 0° and 40° or 45° would be sufficient.

If the recoil lengths do not correspond to the above values owing to worn parts, the adjustment may be made, i.e. shortening of the recoil on the spot. In such case the lock nuts on the rod should be loosened and the nut on the rod turned so that turning of the counter piston rod to left is achieved (when looking in the firing direction). For the purpose of shortening the recoil length the rod may be moved maximum 2 mm because by moving it over 2 mm the recoil length would be greater at greater elevations.

If after moving the regulator rod for 2 mm. the recoil length is not brought within the above limits, then the worn out piston rod head should be replaced with the spare head along with the necessary work prescribed in section E.

I. DE-COPPERIZATION OF THE BARREL BORE INSTRUCTIONS

The barrel bore, after a greater number of rounds fired may suffer from accumulation of copper. Most frequently the main copper accumulation, appears at about 300 mm from the centered slope of the barrel and further toward the muzzle of the barrel the thickness of the copper layer is decreasing. The thickness of the copper layer depends on the number of rounds fired as well as of the propellant charge strength most frequently used. The thickness of the copper layer may reach even 0.3 mm.

In the following cases the copper accumulation in the bore of the barrel should be removed:

- if, owing to copper accumulation the muzzle velocity falls off, and the reason is not the worn bore,
- If the visual inspection of the barrel bore for defects or fissures must be made.

By barrels from which minor numbers of rounds were fired may also come to slight decrease in muzzle velocity after several rounds fired. This will however disappear as soon as the copperization of the barrel bore becomes stable. If, after this, the change from stronger to weaker propellant charge is made, usually the tendency toward increasing of the muzzle velocity will appear owing to removal of copper accumulation from round fired as well as owing to heating of the barrel, until the copperization of the barrel becomes stable.

Thus, if the switch from big to small propellant charge is being made, the first few rounds should be considered as conditional and not taken in account during correction firing. Excepting these conditional rounds, the copper accumulation in the barrel (provided the layers are not too thick) has no influence on the ballistic characteristic.

The barrel should never be discarded because of copperization, but in above mentioned cases it ought to be de-copperized.

The de-copperization of the barrel bore is performed chemically with solution R-56, which does not affect the material of the barrel.

The characteristics of the solution R-56 follow:

- the de-copperization is quick and effective,
- the solution is stable during storage and its efficiency does not change even after months of storage,
- the solution is easy to keep, it is not inflammable nor explosive and does not create poisonous vapors,
- performing of de-copperization with this solution is very simple and does not require specially trained labor,

- One plastic baggie (zipper) marked in: negative dependence =
bending; it should be covered with protective paper. Place around,
zipper closed and on.

The correlation coefficient $r = 0.91$ is given by

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THE SECRETARY OF THE ARMY AND NAVAL DEPARTMENT
WASHINGTON, D. C.

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The pickup is 5 feet in section 5 adjacent to reference number 11 and 3 feet adjacent to the upper accumulation thickness.

Discarded the barre from the preceding and pull out the barre from the skin. Follow in preceding and is-reading the barre and then with help bore. First, wipe the barre with hand wipe and then with damp wipe saturated in skin wipe. The barre bore. Then the barre muscle should be plugged with the sealing disc as shown in figure 97 and 98 and the barre. Set in vertical position, the thicker part of the barre upward as shown in figure 97. Pour boiling water into the barre. Soak and after 10-15 minutes drain the water and fill up again with boiling water. After pouring the boiling water into the barre bore with clean brush and pour out the water again. Repeat this procedure with boiling

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water once more and dry the bore with rags. In this manner cleaned, the barrel bore is ready for de-copperization.

THE PROCEDURE FOR DE-COPPERIZATION OF THE BARREL BORE

1 - On the well cleaned and de-greased barrel on the muzzle end, the sealing disc with rubber sealing is attached. The rubber sealing should be first examined to make sure it is not damaged. Attach the collar on the barrel just below the muzzle and connect it with the sealing disc by means of two screws. By tightening the wing nut, the sealing disc should be well tightened against the muzzle face surface to insure sealing.

The sealed barrel should then be set in vertical position and by means of the appropriate clamp it is being fixed on the azote cart (see figure 99); before this the azote bottle ought to be removed from the cart. Be sure to tighten and fix the barrel on the cart so that it keeps in vertical position. In this manner the barrel will be safe from swinging, otherwise there would be danger of spilling the solution from the barrel bore and this could have undesirable consequences.

If no cart is available, the sealed barrel should be fixed in vertical position in a manner suitable to enable easy and safe pouring out of the solution from the barrel after de-copperization.

The person who is pouring the solution into the barrel must stand on sufficiently wide and strong platform high enough that the opening on the chamber side which is turned upward, reaches his waist. All personnel engaged in de-copperizing (3 men), should wear rubber aprons, boots, gloves and goggles for protection of their eyes because the solution is very aggressive. The protection measures must be respected also during mixing of the solution including crumbing of CrO_3 .

Pouring of solution into the barrel should be done with an enamelled funnel. The funnel would not be required if the utensil with the solution has a pouring spout. The utensil of 10 liters capacity from which the solution is being poured should also be enamelled. If the solution is being poured in open air, windy weather should be avoided, because the drops carried by the wind could cause injuries of unprotected parts of the body. During pouring care should be taken not to spill any solution. During de-copperization no other parts of the weapon should be kept nearby.

The solution should be poured into the bore until it covers the grooved part of the bore. For this approximately 4 liters of solution are required. If more than one barrel bore is being de-copperized, for the successive barrel bores add to the existing solution the necessary quantity which is being lost during the manipulation with the solution.

After checking that the solution surely reached the necessary level, covered the centered slope, cover the barrel with a clean lid. Depending on the thickness of the copper accumulation, leave the solution in the barrel for about one hour and if necessary even two hours. With the same solution it is possible to de-copperize a number of barrel bores.

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After this by gradual tilting of the barrel, pour the solution into the utensil carefully. If on other barrel bore is to be de-copperized immediately, return the solution in the glass demi-john.

WASHING OF THE BARREL BORE AFTER DE-COPPERIZATION

Immediately after pouring out the solution, the barrel must be well washed and cleaned because otherwise the remaining acid may corrode the metal. Washing of the barrel should be done as follows: Firstly the barrel is rinsed with water and then boiling hot water is being poured into it. The water should be kept in the barrel for about 10 minutes. After this water is drained, the barrel is filled again with hot water in which potassium soap is dissolved and the walls of the barrel bore well brushed. The suds should be then drained and the barrel filled with hot water and brushed two times more. Following this the sealing disc should be removed and washed. The muzzle and the exterior of the barrel should be washed too because there is a possibility that it was sprinkled with the solution. The barrel should then be dried with rags and its bore inspected for the purpose of checking the efficiency of de-copperization. When necessary repeat the procedure. If anywhere in the bore a copper layer remained after the action of the solution, and having in view that now this layer has become brittle, by driving through the bore a wooden plug an attempt to eliminate this layer should be tried.

J. INSTRUCTIONS FOR THERMO - TREATMENT

In order to enable proper repairs of parts during welding or thermo-treatment of newly made parts, in the below given tables are the types of useable steels with necessary characteristics:

CARBON STEELS

Marking of material	Composition	Mechanical Characteristics				Application
		Condition	Elasticity limit kg/mm ²	Tenacity kg/mm ²	Elongation L = Sd%	
C 16+	C = 0.15 P = 0.035 S = 0.035	Improved	30	50 - 65	16	
C 22+	C = 0.22 P = 0.035 S = 0.035	Standard	24	42 - 50	27	For less burdened small parts, screws, nuts, bolts pins.
		Improved	30	50 - 60	20	
C 35+	C = 0.35 P = 0.035 S = 0.035	Standard	28	50 - 60	22	
		Improved	37	60 - 72	18	
C 45+	C = 0.45 P = 0.045 S = 0.045	Standard	34	60 - 72	17	
		Improved	40	65 - 60	14	
C 60	C = 0.60 P = 0.035 S = 0.035	Standard	39	70 - 85	14	
		Improved	40	75 - 90	11	

+ All above steels should be welded with electrode „Triglav“ or other corresponding to this quality.

THERMO-TREATMENT FOR CARBON STEELS

Marking	Forging °C	Normalizing °C	Soft glowing °C	Tempering °C	Means	Annealing °C
C 16	1100-850	890-920	650-680	780-900	Water	150-175
C 22	1100-850	870-900	650-700	860-890	Water	530-670
C 35	1100-850	850-880	650-700	850-880	Oil	530-670
C 45	1100-850	830-860	650-700	830-860	Oil	530-670
C 60	1050-850	820-840	650-700	810-840	Oil	530-670

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The markings for carbon steels in the above table are given according to DIN (German Indust. Standards) rules. These rules are known throughout Central European Countries and are applied in majority of European steel producing factories.

The markings of steel, for example the mark C 35 represents the quantity of carbon, in this case 0.35%.

ALLOY STEELS

Application	Denomination and composition of material	Mechanical Characteristics				
		Elasticity limit kg/mm ²	Tenacity kg/mm ²	Elongation L 5d%	Contraction %	Toughness kg/mm ²
For very highly strained and important parts	FLW 1456 ⁺⁺ C=0.24-0.34 Mn=0.70 Si=0.40 P=0.035 S=0.035 Cr=2.3-2.5 Mo=0.10-0.25 V=0.10-0.35	over 70	over 85	over 13	over 40	over 4
For less strained important parts	⁺⁺ Chromium - molybdenum vanadium steel LFW 14528 ⁺ C=0.25-0.28 Mn=0.75 Si=0.35 P=0.025 S=0.025 Cr=0.7-1.2 Mo=0.15-0.25	over 45	over 65	over 16	over 60	over 10

+ Chromium - molybdenum steel

THERMO-TREATMENT FOR ALLOY STEELS

Denomination of steel	Forging °C	Normalizing °C	Soft glowing °C	Tempering °C	Means	Annealing °C
+++ Chromium-molybdenum	1050-850	860-890	700-730	860-890	Water Oil	530-670
Chromium molybdenum vanadium steel +++	1100-850	870-900	690-720	870-900	Oil	560-590

+++ Should be welded with electrode „Galeb 70“ or corresponding to this quality.

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During forging, tempering, annealing and other heating works, the determined temperature limits should be strictly adhered to as prescribed for each type of steel.

If no other means are available for establishing the steel temperature, then the temperature may be determined by the colour of the material, during, as follows:

Forging, hardening and glowing temperatures

550°C - dark brown	850°C - bright red
630°C - brown red	900°C - very bright red
680°C - dark red	950°C - yellow red
740°C - dark cherry	1000°C - dark yellow
770°C - cherry red	1100°C - bright yellow
800°C bright cherry red	1200°C - yellow white

Annealing temperatures

200°C - faint yellow	290°C - dark grey
220°C - straw yellow	300°C - blue
240°C - brown	320°C - bright blue
260°C - purple	350°C blue grey
280°C - violet	400°C - grey

During forging the pieces should be gradually heated up to the determined forging temperature. When forging the above forging temperature limits should be adhered to. The pieces should not be kept long at high temperatures. Cooling after forging should be slow on still air.

Normalizing should be performed until the desired temperature in the core of the material is achieved.

The height of the temperature and the time of glowing by all thermo-treatment methods is being adjusted according to the size of the piece and function of the part. The glowing temperature should be uniform on all sides and in the core.

The forging method depends on the shape and size of the piece being treated. Hardening of FLW 1456 steel is done in oil only. The annealing temperature is being adjusted according to the desired hardness and the annealing duration according to the size of the piece.

After annealing the pieces should be cooled on still air or in dry ashes.

APPENDIX I

STORAGE AND MAINTENANCE OF WEAPONS IN DEPOTS

The weapons which are located in depots should be well cleaned, greased or preserved depending on the time foreseen for issuance from the depot.

If the weapons are on short-term keeping (up to 3 months), then it will not be necessary to dismantle them in assemblies or to perform any special preservation of parts. Standard lubrication of unpainted and blackened surfaces with gun grease would be sufficient. The barrel should be cleaned (washed) and greased following the separate procedure.

The weapons which are being stored for an extended period of time (over 3 months) may be kept completely assembled or partly disassembled, depending on available storing space, provided the parts are grouped in the vicinity of the belonging weapon.

The weapons and the weapon and battery sets of spares, tools and accessories which are being stored for an extended period of time should separately be preserved. Prior to preservation, the weapons should be absolutely clean, especially the parts that were in contact with propellant powder gas.

The preservation procedure for weapons and spares, tools and accessories set, is as follows:

- The exterior of the barrel is being preserved with „Shell Ensis Fluid 250“.
 - For lubrication and preservation of cradle slides, barrel mantle slides, equilibrators, loaded sectors, traversing and elevating mechanisms, geared shafts on the cradle, interior of the recuperator working cylinder up to the piston as well as the sliding surfaces of the breechblock and the breeching, gun grease should be used.
 - For preservation of all remaining unpainted and blackened surfaces of the weapons as well as the metal parts of the weapon and battery sets of spares, tools and accessories, „Shell Ensis Fluid 250“ should be used.
 - For greasing and preservation of ball and roller bearings, ball bearings, grease (KLM-3) should be used.
 - For preservation of sighting devices, grease for instruments should be used.
 - For preservation parts made of leather, the leather grease (K-grease) should be used.
- For these tasks of cleaning and preservation of weapons it is necessary to form a detail consisting of the following personnel:
- 1 artillery artisan who is well familiar with this weapon,
 - 1 assistant artillery artisan who is trained in disassembling of this weapon,

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- 10 soldiers for: one for washing, three for cleaning, two for wiping and drying of parts and one for lubrication. The remaining three are used for carrying of the material.

The artillery artizan supervises the technical work of the detail, organises the work and cleans the most sensitive parts, which require expert knowledge during cleaning. It is his responsibility to inspect the cleaned parts prior to lubrication, to assembly the parts and to prove the proper functioning after assembling.

The cleaning and preservation detail must receive practical training on the material prior to starting of the work.

Such a detail is able to clean and preserve approximately eight weapons per day.

Detailed cleaning and preservation of the weapons in store must be performed at least once in a year. The old grease is being removed with rags. The preservation means „Shell Ensis Fluid 256 and 260“ may be removed with rags saturated in petrol.

The cleaned and preserved weapons should be lined up on the front and depth one behind and on the side of the other with the carriage trails facing the exit. The spacing between each weapon should be at least 70 cm to enable artificial recoil of the barrel and inspection of the weapon. The valves of the recoil brake and of the recuperator should be approachable and after checking they should closed well and sealed.

The weapons must rest on the supports with the wheels off the ground and spring devices relaxed. The carriage trails also must rest on wooden supports. To relax the equilibrators springs the barrel should be given the maximum elevation. The firing parts in the breechblock should be in fired position.

The panoramic sights should be removed from the range quadrant and kept in their boxes in separate room on shelves, which are raised off the ground. The same applies for storage of weapon and battery sets of spare parts, tools and accessories.

The tyres on wheels should be absolutely clean without any foreign matter. Besides the wheel should be periodically rotated. For this purpose the wheels are divided in 4 parts and so marked and should be turned for 90° at intervals of at least every ten days.

If dark green or dark brown spots are noticed on the tyres, the tyres should be first washed with formalin and then with clean water and dried.

All other parts made of rubber which are not attached to the weapon should be stored in a separate dark room in which the temperature moves around 15°C. The humidity of air in this room should be between 40 - 65%.

The spare tyres and tubes should be talc powdered.

The rubber jointings should be kept in boxes and talc powdered. The storing life for rubber jointings if properly kept is approximately five years.

[illegible]

APPENDIX II

HYDRAULIC LIQUID STEOL MM

Steol MM is a hydraulic liquid on the basis of glycerine and alcohol. For improvement of anticorrosive properties corrosion inhibitors are added to the liquid.

Compound and ingredients of glycerine liquid „Steol MM“:

- Glycerine	55,7%
- Ethyl alcohol	9,6%
- Distilled water	33,5%
- Sodium benzoate	1,0%
- Sodium nitrite	0,1%
- Trietanolamine	0,1%

The manufacture of „Steol MM“ according to the above compound is performed by simple mixing of the ingredients in cold condition in a clean and well degreased container.

The raw materials used for production of Steol MM shall conform to the following conditions:

- Glycerine refined with glycerine contents not less than 90%
- Ethyl alcohol 95%
- Distilled water with electrical conductivity not more than 30×10^{-6} Ohm. $\cdot \frac{1}{x} \text{ cm} \cdot \frac{1}{l}$.
- Sodium benzoate chemically pure.
- Trietanolamine chemically pure.

Liquid appearance: clean colourless or mostly light - yellow liquid without undissolved particles and mechanical impurities:

- Specific weight at 20°C: between 1,110 - 1,140
- Viscosity at 20°C: 1,7 - 2,0°E
- pH value at 20°C: $8,0 \pm 1,0$
- Freezing point: under - 40°C
- Chlorid and sulfate: in traces
- Steady in storage and use.

Sampling and testing of glycerine liquid „Steol MM“

The sampling shall be made in a manner to represent the entire delivered quantity or party. In the case of smaller packing (20 kg cans) at random from the whole delivered party 10% of partial packings are selected and from each selected can by means of glass tube from top, from middle and from bottom of the can approximately the same quantity of Steol is taken in a way to get a total sample of 3 kg. This is poured in a clean dry 3 liter bottle, shaken more times to become homogeneous and then the whole quantity of the sample is divided in

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three clean dry 1 liter bottles. The bottles are then sealed in a way that they can not be opened without damaging the seal. Each bottle shall have a vignette marked with „Steol MM“, name of producer, date and place of sampling, net quantity of delivered party and signature of the person who made the sampling. In the case of larger packing (barrels of 200 kg) sampling is made from each barrel the same way as described above.

The appearance of liquid is checked by visual inspection, viewing the steol poured in a wide test tube against light.

The specific weight is determined with an aerometer at a temperature of 20°C.

The viscosity shall be determined using a suitable viscosimeter (Engler, capillary or other) at 20°C in Engler degree.

pH value shall be determined with a suitable pehameter (acidimeter) at 20°C or if a pehameter is not available then corresponding indicator papers with an accuracy of 0,2 pH value be used.

The freesing point is determined in the same way as by testing of oils, cooling is achieved with dry ice.

The chlorid content is determined taking 10 gr. of steol deluted in 40 ml of destilated water being soured adding concentrated nitric acid p.a. and adding 1 ml 5% delution of silver - nitrate. After half of an hour being in dark, no residue or unclearness should appear, only weak opalescent is allowed. Sulfate content is checked deluting 10 gr. of steol in 40 ml of destilated water being soured adding concentrated hydrochloric acid p.a. and adding 2 ml 10% delution of bariumchlorid. After one half of an hour no residue or any unclearness, only weak opalescent is allowed. Testing of steadiness is performed putting 100 gr. of steol in a glass bottle of 250 ml. with an even bottom and grinded neck on which a return cooler is suited. Steol is warmed during one hour to boiling point with return cooling. After this being done the Steol should not change.

Packing and storage

Steol MM is packed in cans made of zinc coated sheet capacity 20 liters or in zincoated barrels capacity 200 liters, accordingly as provided in the contract between the Purchaser and the Supplier. The containers must be hermetically closed and sealed.

Steol shall be stored in dry and cool stores protected from direct sun light.

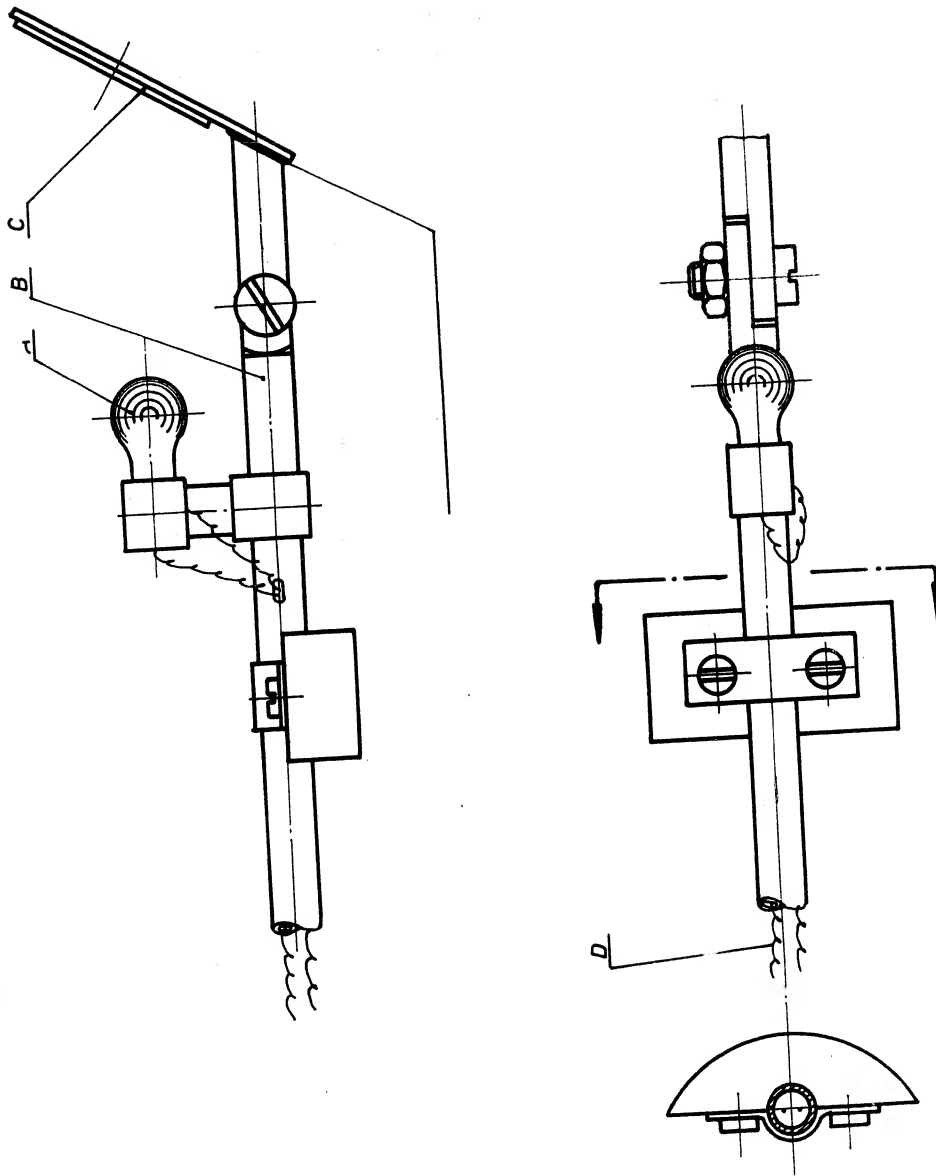


Fig. 1 — BARREL BORE ILLUMINATING EQUIPMENT
 A — Bulb 12-volts, B-Carrier-rod, C — Mirror, D- Current supply

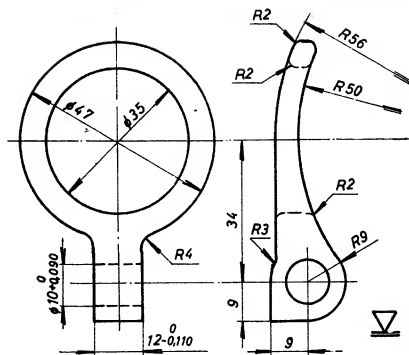


Fig. 2
BARREL LIFTING
RING — FRONT

Material: C 45

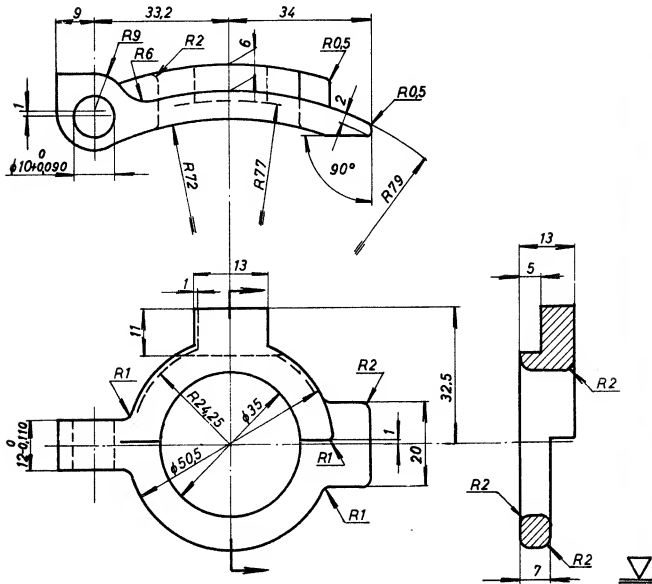


Fig. 3 — BARREL LIFTING RING — REAR
Material: C 45

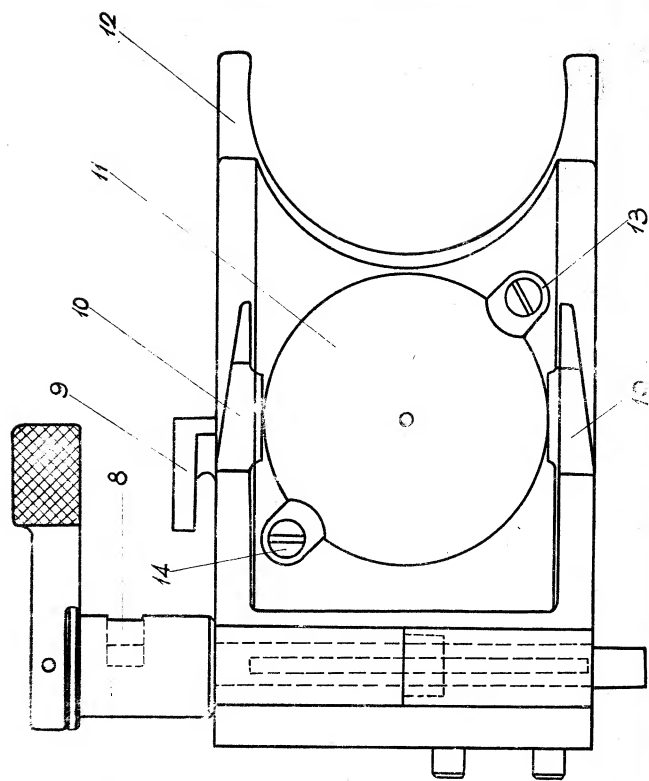


Fig. 4 BREECHBLOCK ASSEMBLY (WITH THE FRONT PLATE)

- | | |
|--------------------------------------|----------------------------------|
| 7 — Seal | 11 — Front plate |
| 8 — Extractor shaft retainer seating | 12 — Breechblock body |
| 9 — Extractor shaft | 13 — Front plate fastener |
| 10 — Extractor | 14 — Front plate fastening screw |

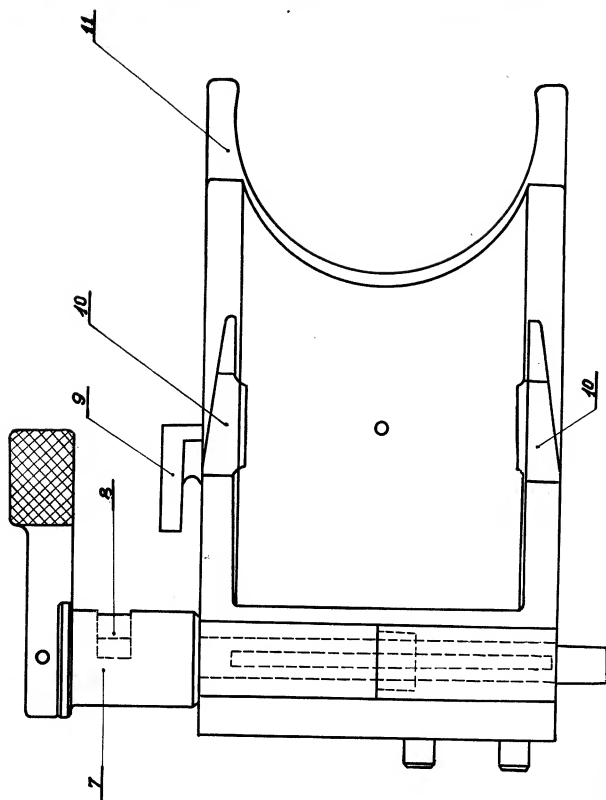


Fig. 4a — BREECHBLOCK ASSEMBLY (WITHOUT THE FRONT PLATE)

- | | |
|--------------------------------------|-----------------------|
| 7 — Extractor shaft | 10 — Extractor |
| 8 — Extractor shaft retainer seating | 11 — Breechblock body |
| 9 — Sear | |

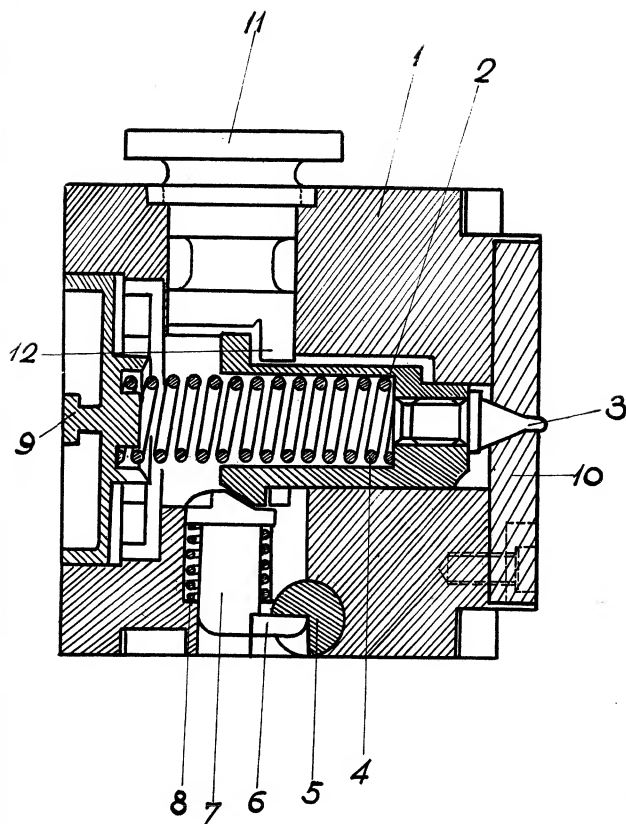


Fig. 5 — BRECHBLOCK — SECTION

- | | |
|--------------------|--------------------|
| 1 — Body | 7 — Trigger |
| 2 — Striker | 8 — Trigger spring |
| 3 — Firing pin | 9 — Back plate |
| 4 — Striker spring | 10 — Front plate |
| 5 — Trigger shaft | 11 — Sear |
| 6 — Trigger dent | 12 — Sear dent |

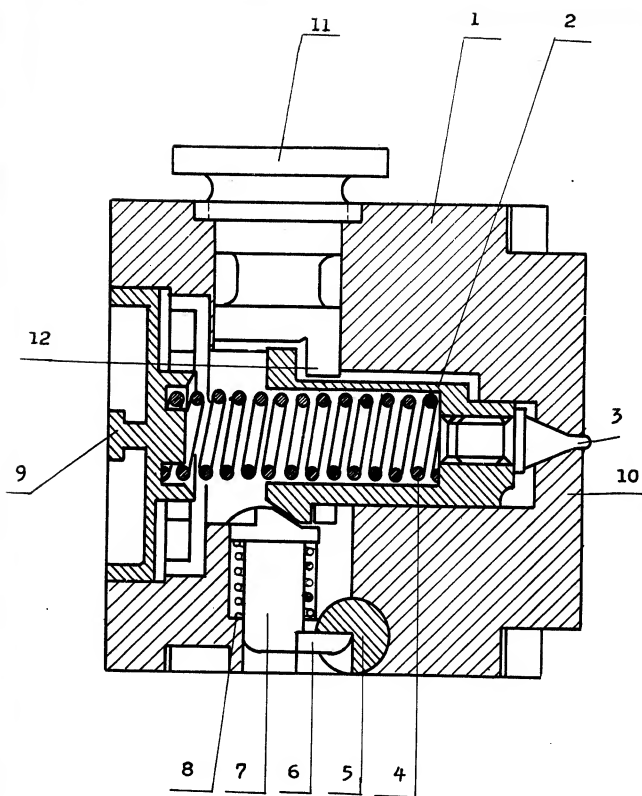
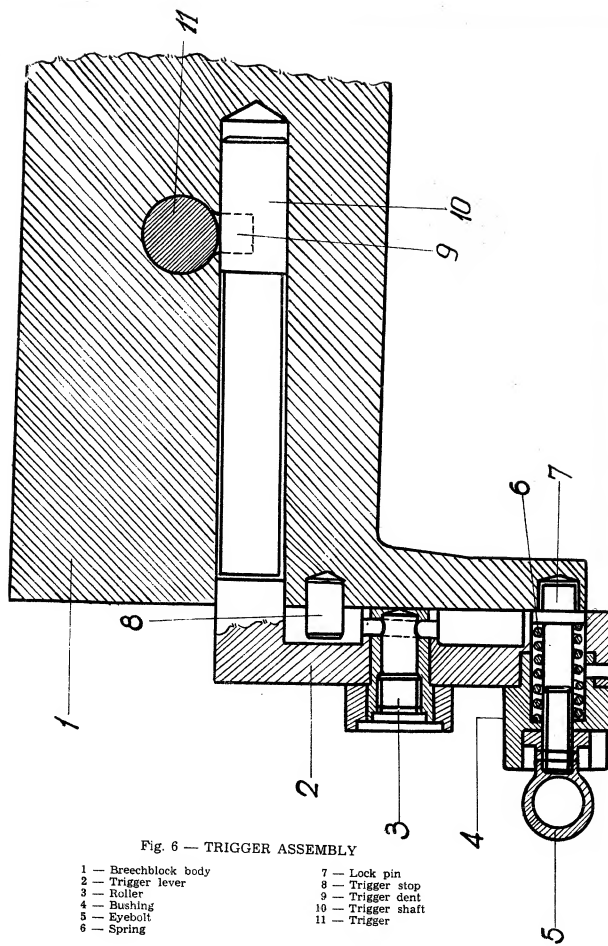


Fig. 5a — BREECHBLOCK ASSEMBLY SECTION (WITHOUT THE FRONT PLATE)

- | | |
|--------------------|-----------------------|
| 1 — Body | 7 — Trigger |
| 2 — Striker | 8 — Trigger spring |
| 3 — Firing pin | 9 — Back plate |
| 4 — Striker spring | 10 — Breechblock face |
| 5 — Trigger shaft | 11 — Sear |
| 6 — Trigger dent | 12 — Sear dent |



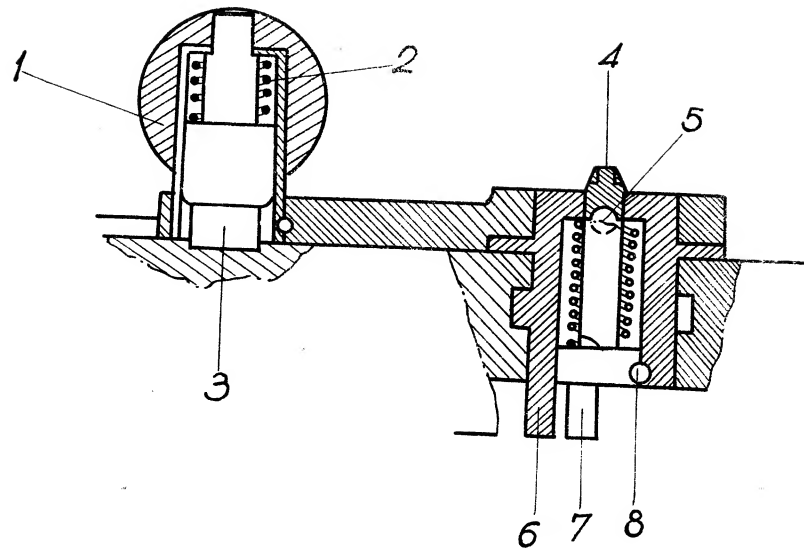


Fig. 7 — RECOCKING HANDLE ASSEMBLY

- | | |
|--------------------|----------------------|
| 1 — Handgrip | 5 — Pin |
| 2 — Spring | 6 — Mechanism casing |
| 3 — Handgrip shaft | 7 — Recocking dent |
| 4 — Rear sight | 8 — Pin |

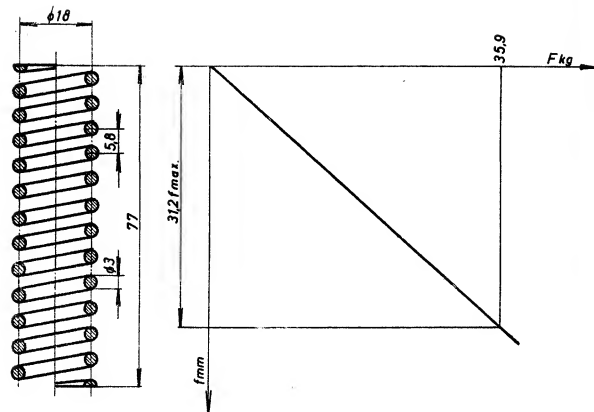


Fig. 8 — STRIKER SPRING
Material: Patent wire 160—180 kg/mm²

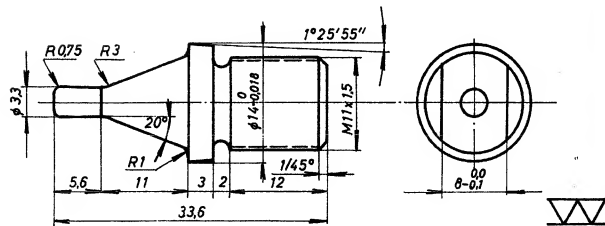


Fig. 9 — FIRING PIN
Material: FLW 1456.5(4)

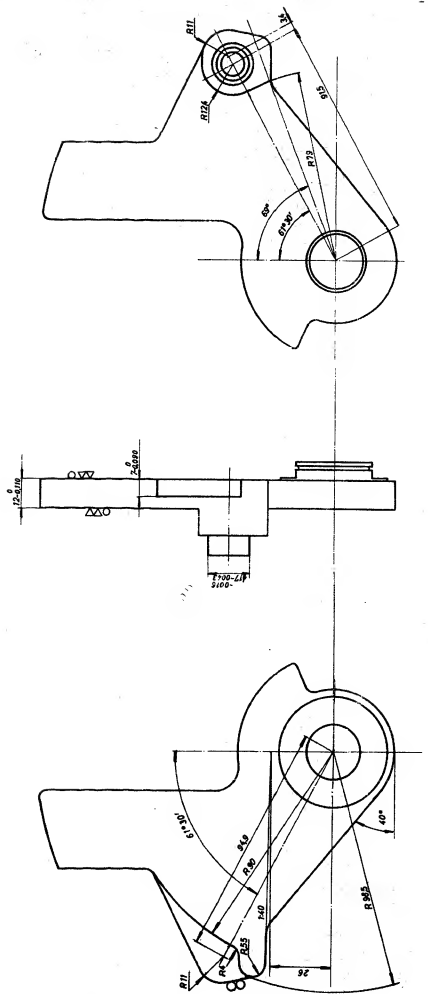


Fig 10 — BRECHBLOCK GUIDE

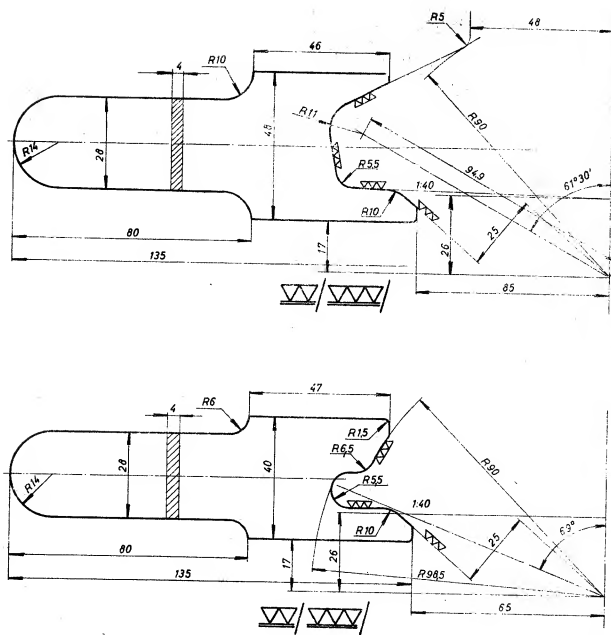
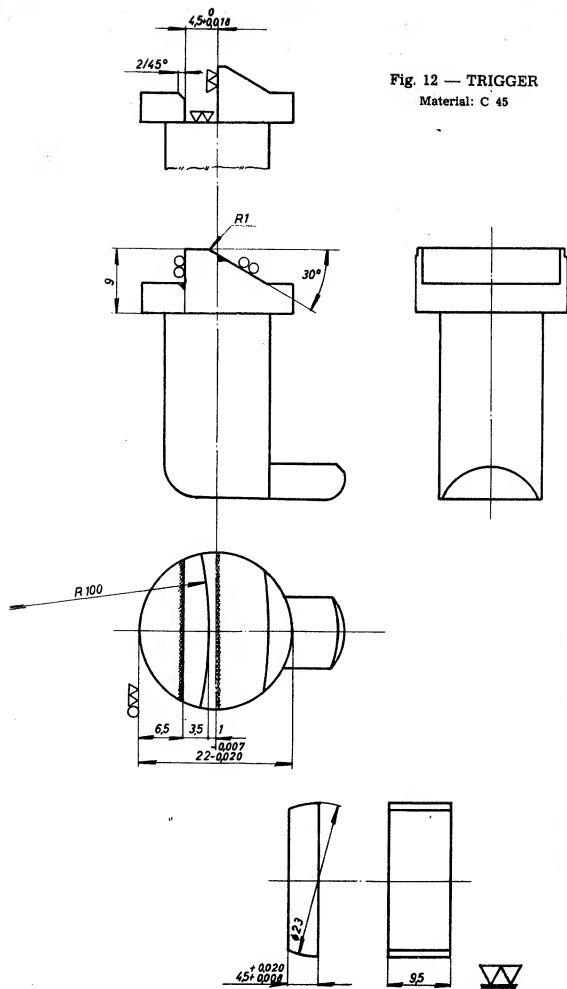


Fig. 11 — PATTERN FOR SHAPING THE BREECHBLOCK GUIDE
Material: C 45



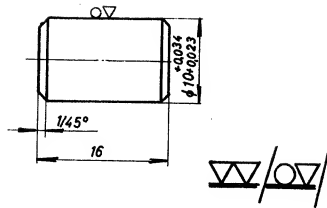


Fig. 13 — TRIGGER STOP
Material: C 45 — blackened

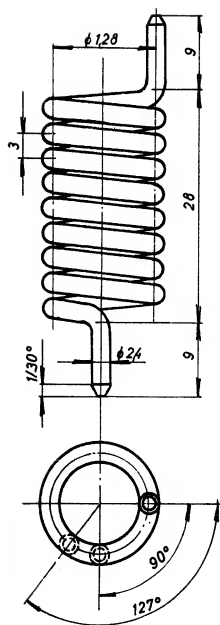
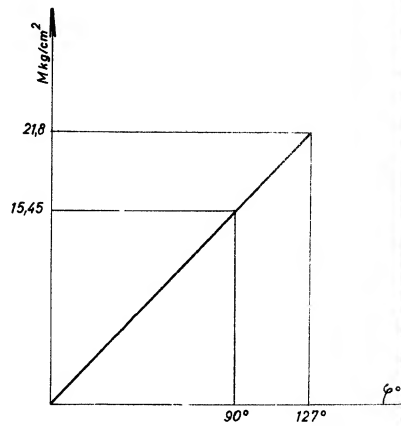


Fig. 14 — RECOCKING HANDLE DENT SPRING
Material: Patent wire 160—180 kg/mm²



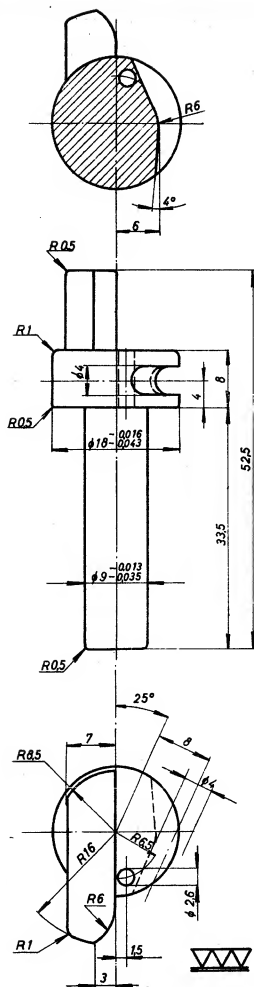


Fig. 15 — RECOCKING HANDLE SHAFT
Material: FLW 1458.5(4)

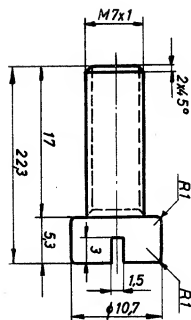


Fig. 16
FRONT PLATE FASTENING SCREW
Material: FLW 1458.5(4)

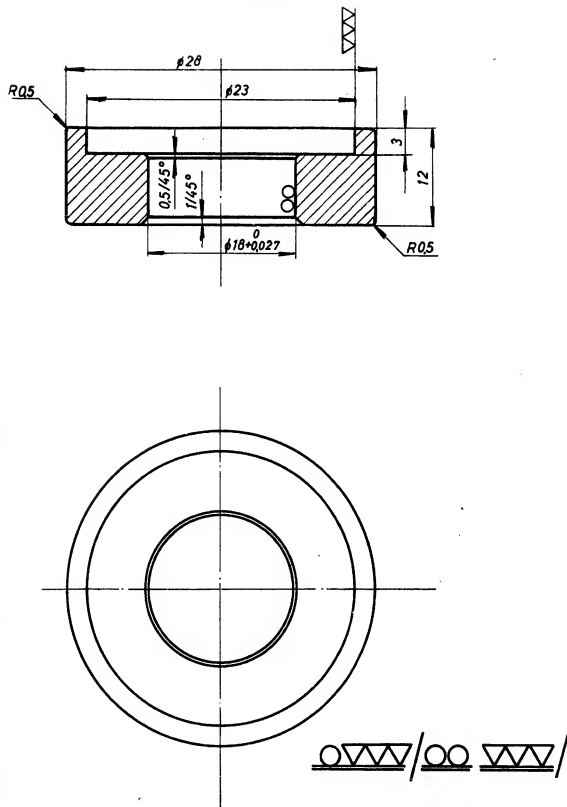
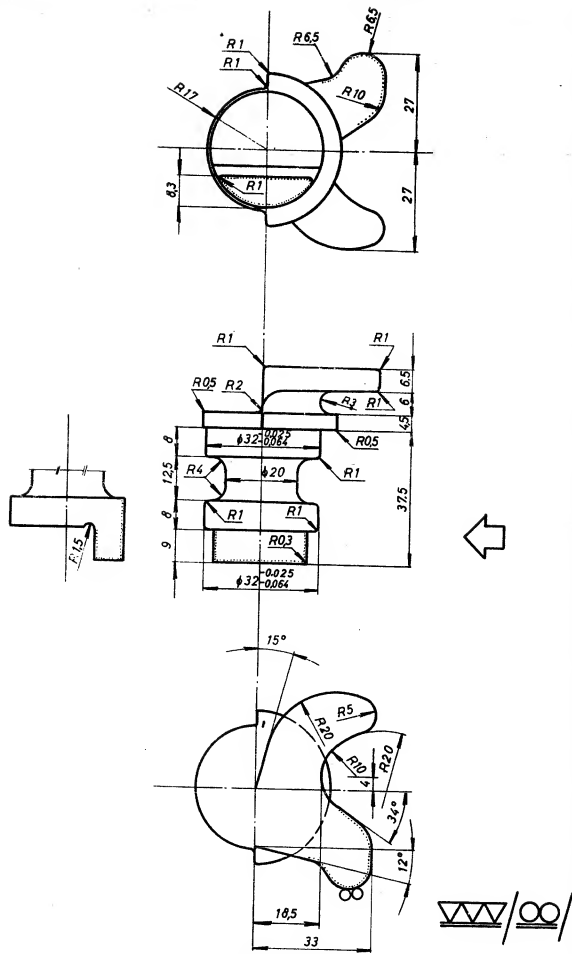


Fig. 17 — BREECHBLOCK GUIDE ROLLER
Material: C 60 — improved



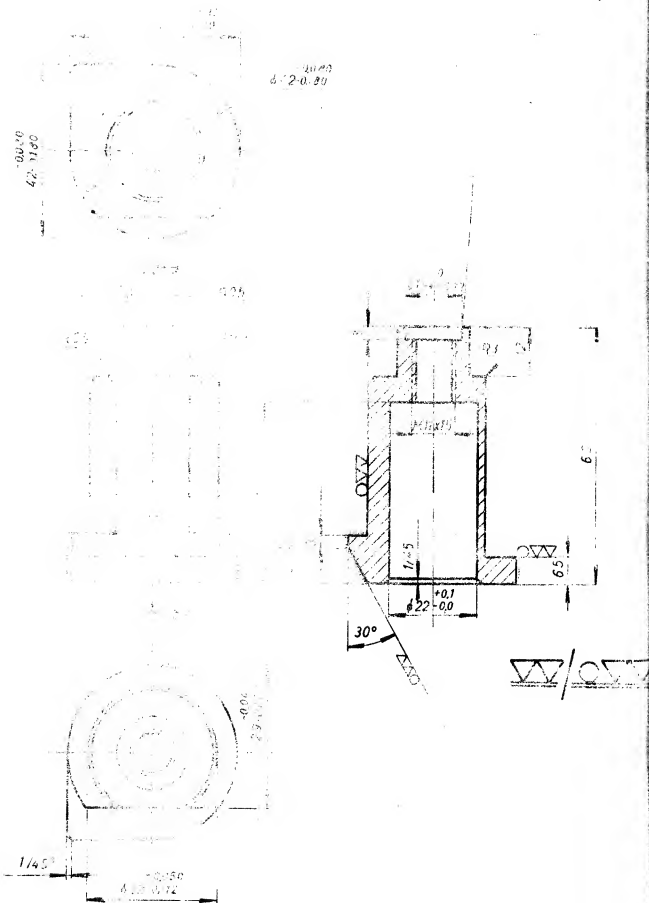


Fig. 21 — STRIKER
Material: FLW 1456.5(4)

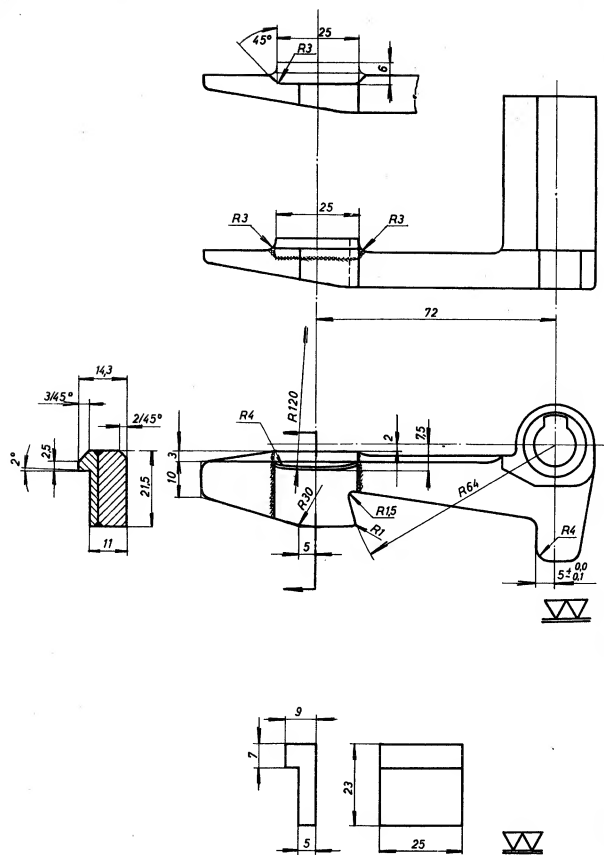


Fig. 22 — UPPER EXTRACTOR
Material: FLW 1456.5(4)

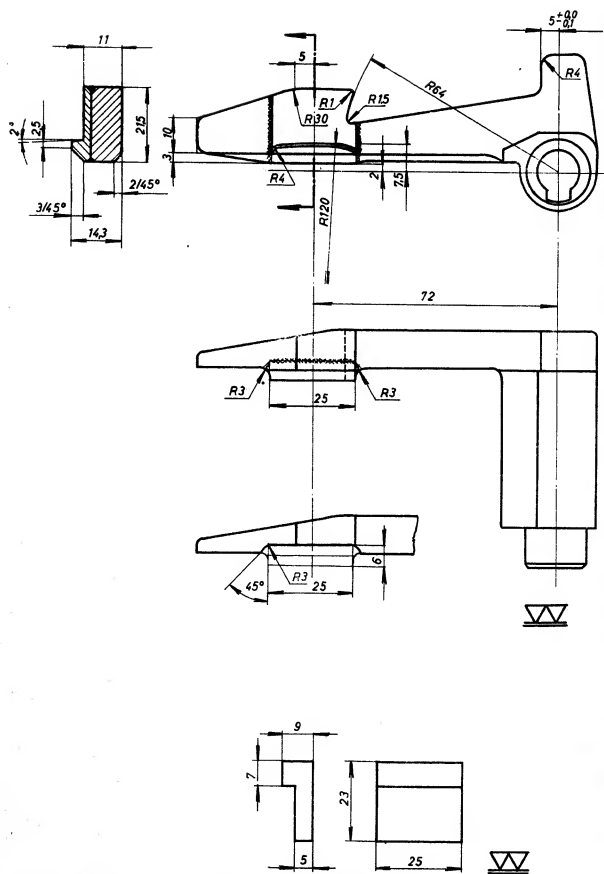


Fig. 23 — LOWER EXTRACTOR
Material: FLW 1456.5(4)

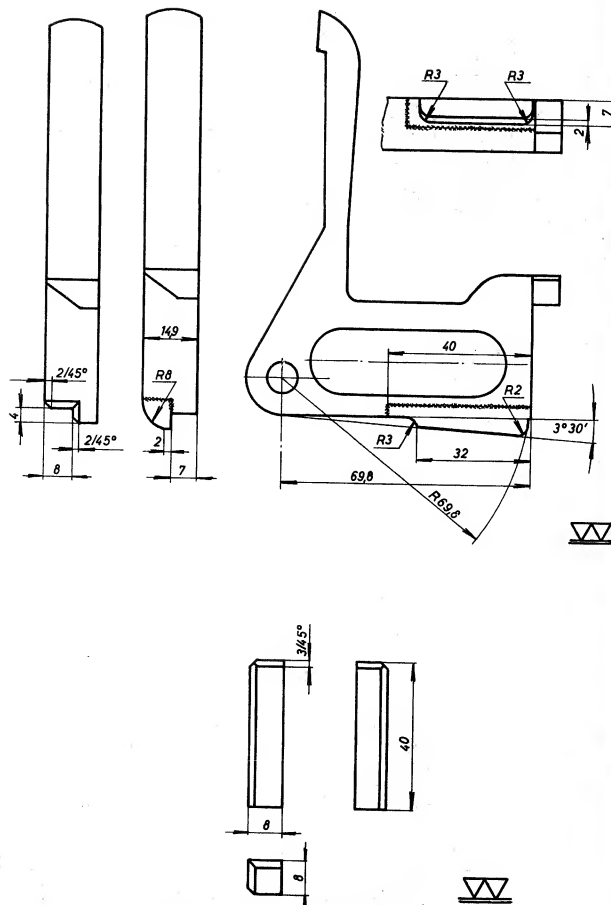


Fig. 24 — BREECHBLOCK HANDLE RETAINER
Material: C 45

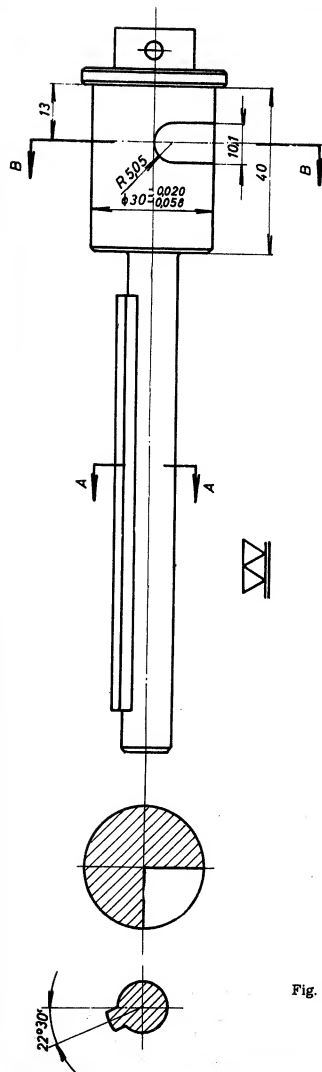


Fig. 25 — EXTRACTOR SHAFT

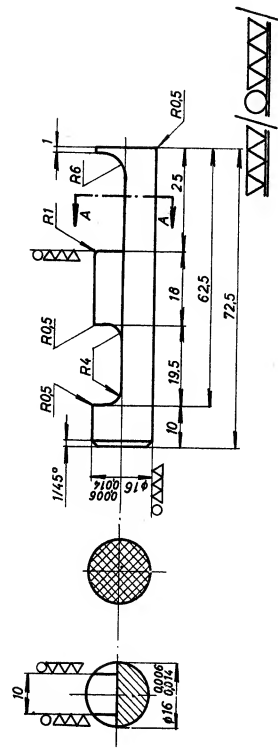


Fig. 26 — EXTRACTOR SHAFT RETAINER
Material: FLW 1458.5(4)

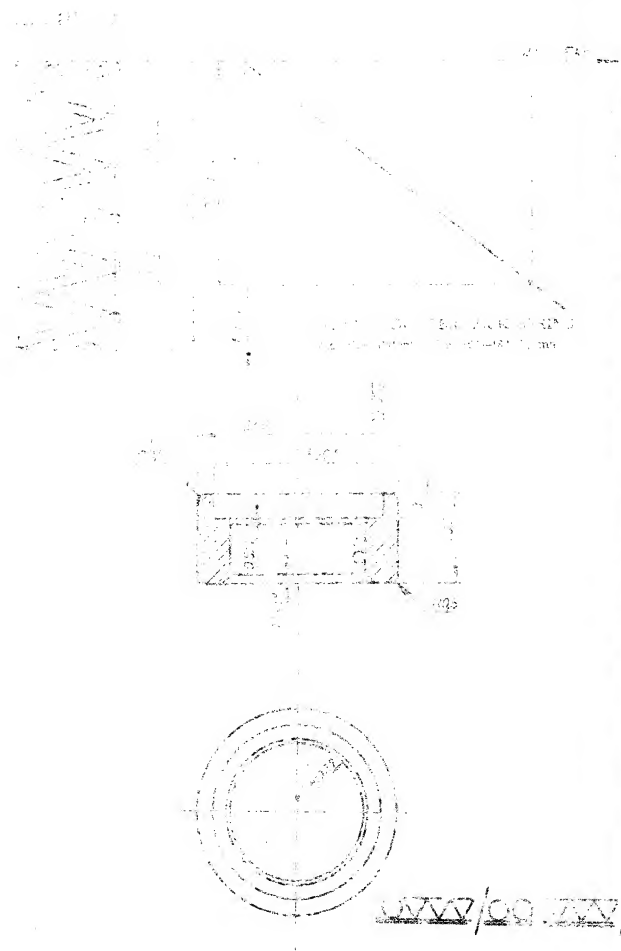
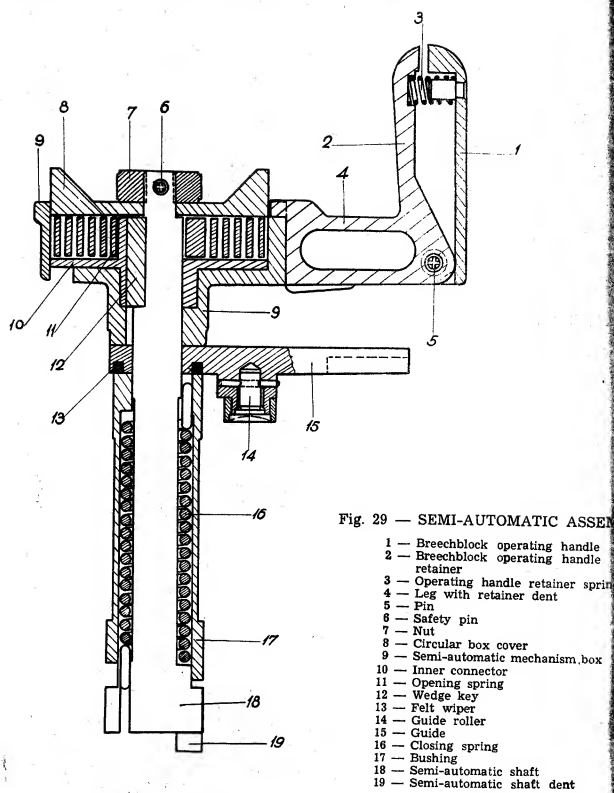


Fig. 28 -- TRIGGER ROLLER
Material: C 80 -- improved



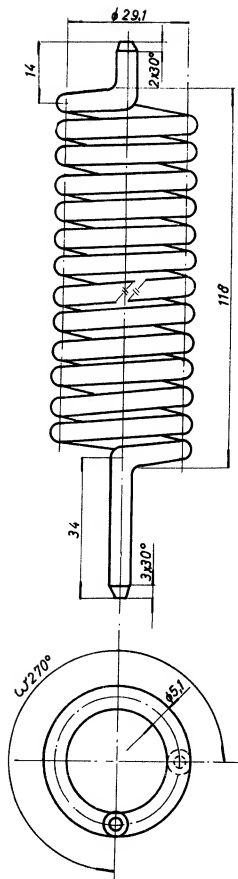


Fig. 30 — BREECHBLOCK CLOSING SPRING
Material: Patent wire 180—180 kg/mm²

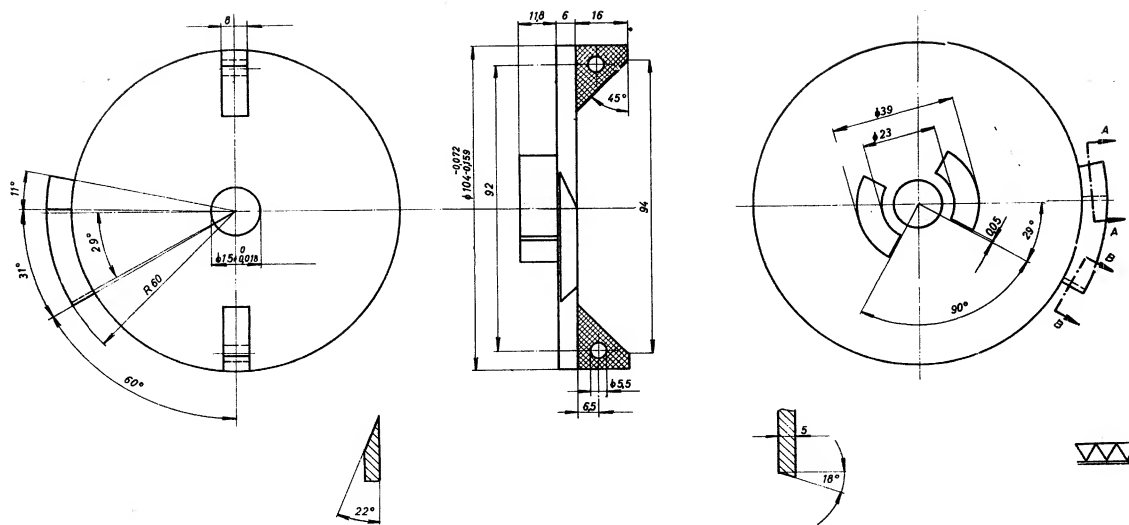


Fig. 31 — CIRCULAR BOX COVER
Material: FLW 1452.4(3)

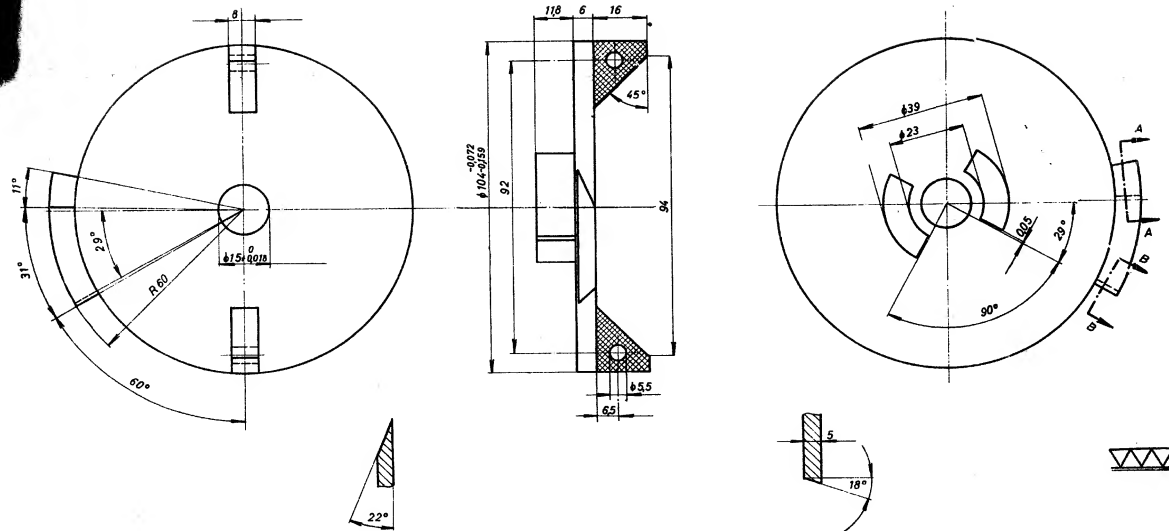


Fig. 31 — CIRCULAR BOX COVER
Material: FLW 1452.4(3)

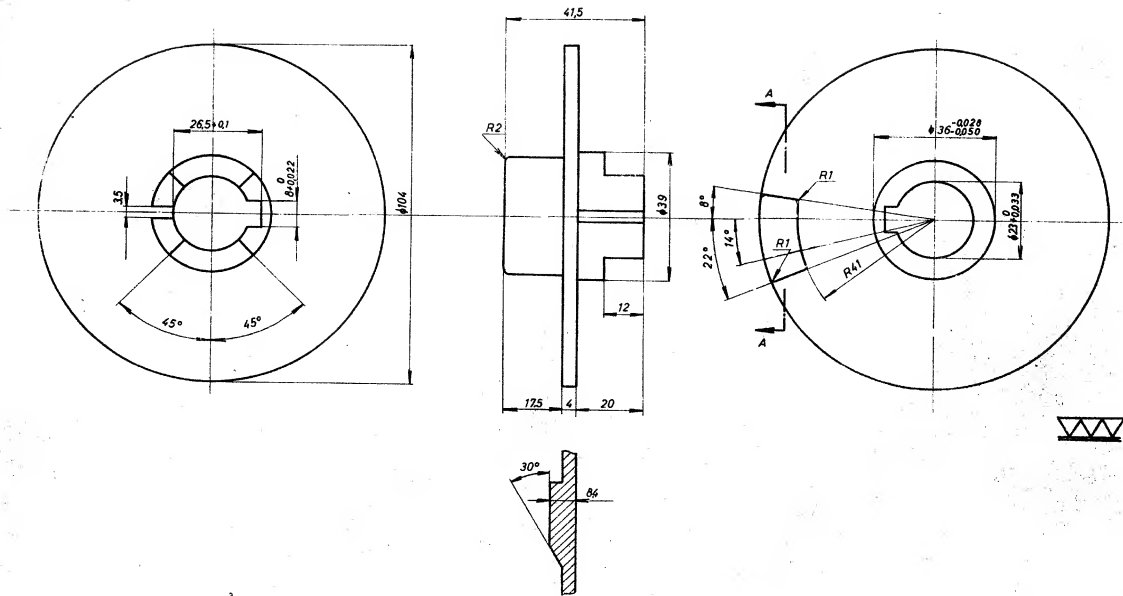


Fig. 32 — INNER CONNECTOR
Material: FLW 1452.4(3)

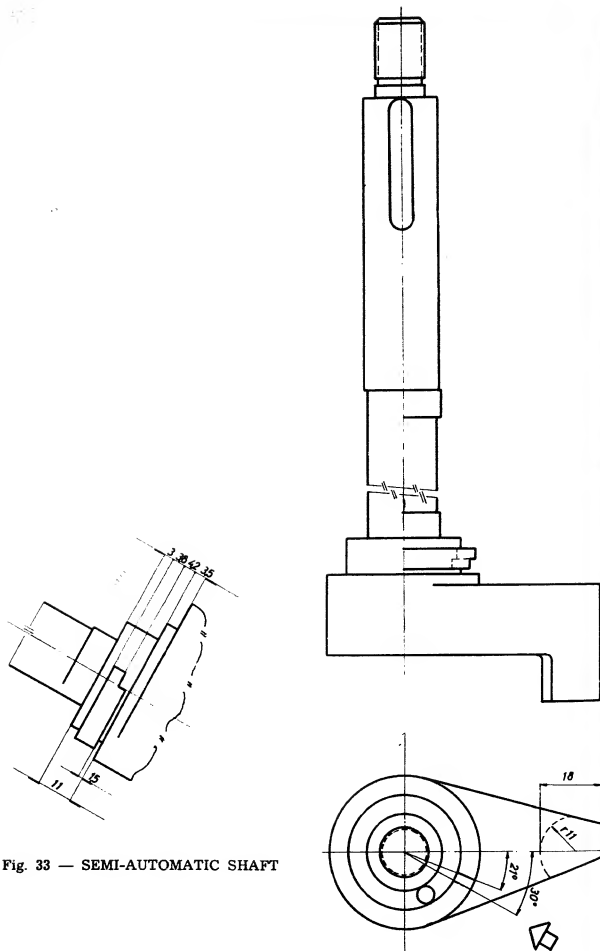


Fig. 33 — SEMI-AUTOMATIC SHAFT

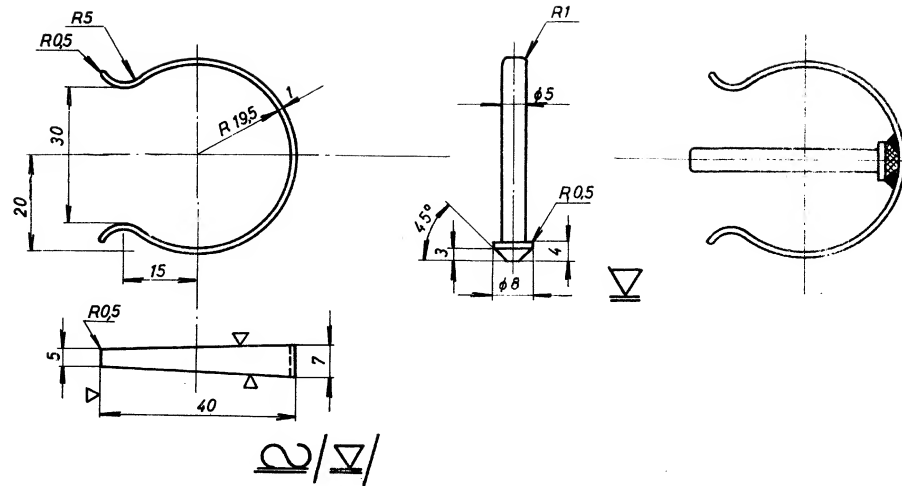


Fig. 34 — SEMI-AUTOMATIC NUT SAFETY ELEMENT

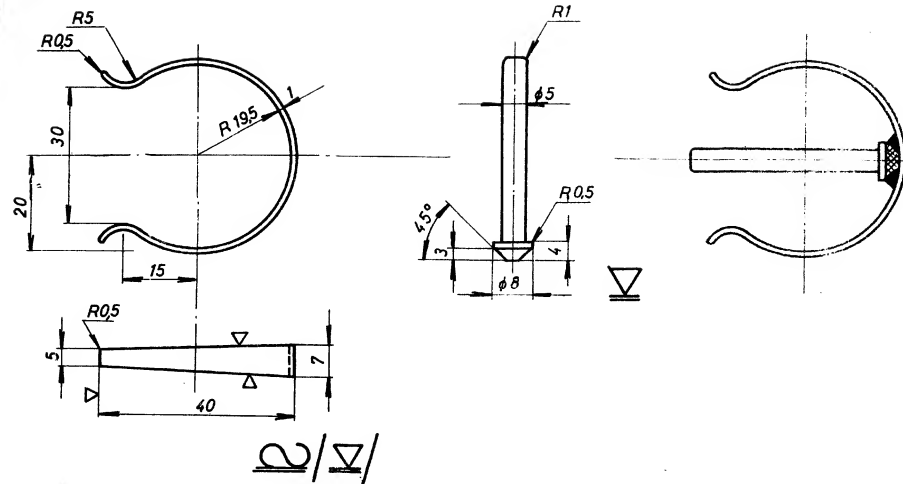


Fig. 34 — SEMI-AUTOMATIC NUT SAFETY ELEMENT

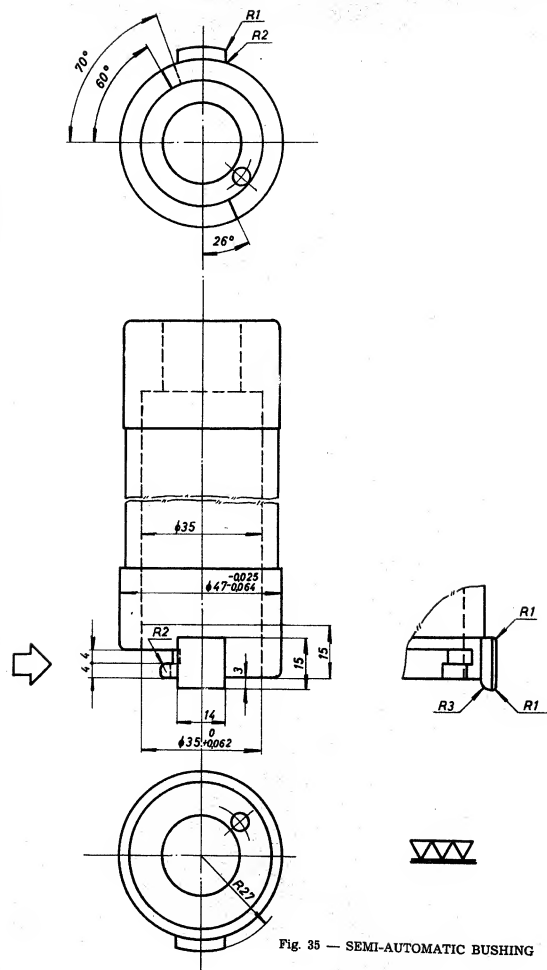


Fig. 35 — SEMI-AUTOMATIC BUSHING

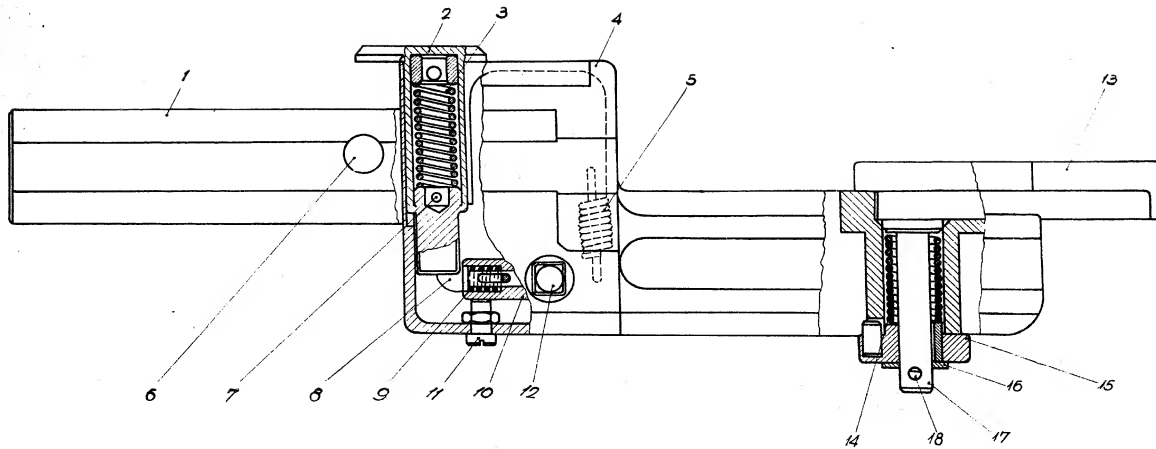
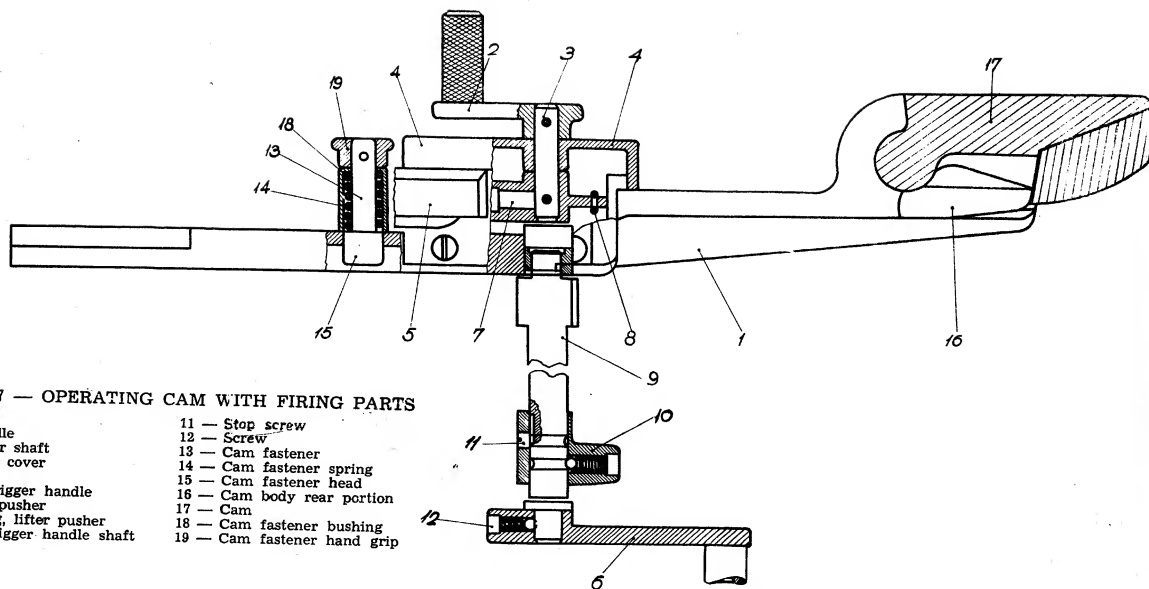


Fig. 36 — OPERATING CAM ASSEMBLY

- | | |
|------------------------------------|------------------------------------|
| 1 — Operating cam body | 10 — Pusher lever |
| 2 — Trigger lifter | 11 — Stop screw |
| 3 — Trigger lifter spring | 12 — Seat, auxiliary trigger shaft |
| 4 — Cam casing cover | 13 — Cam |
| 5 — Auxiliary trigger lever spring | 14 — Cam return spring |
| 6 — Cam fastener | 15 — Nut |
| 7 — Pin | 16 — Washer |
| 8 — Trigger lifter pusher dent | 17 — Cam shaft |
| 9 — Lever spring, lifter pusher | 18 — Pin |



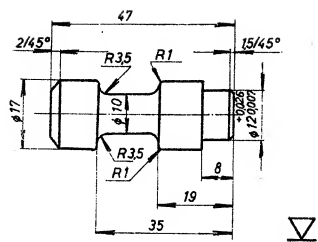


Fig. 38 — AUXILIARY TRIGGER HAND GRIP
Material: C 45

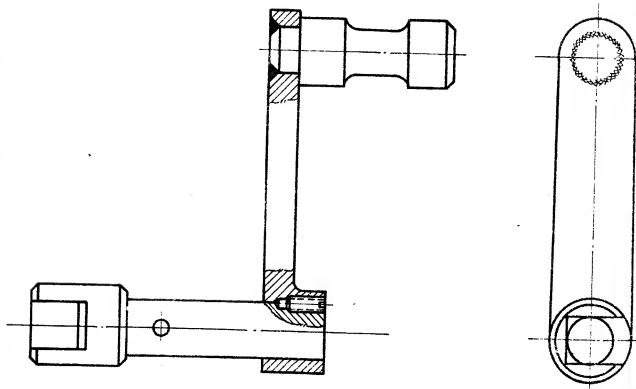


Fig. 39 — AUXILIARY TRIGGER ASSEMBLY

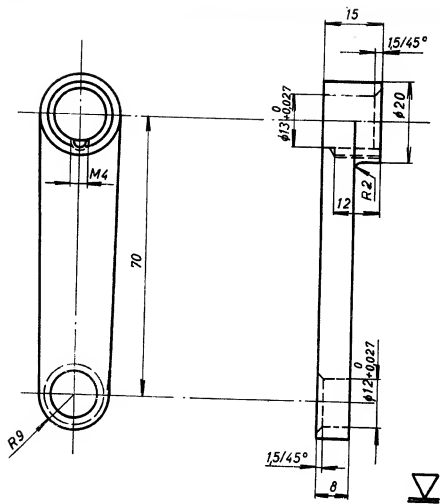


Fig. 40 — AUXILIARY TRIGGER HANDLE
Material: C 45

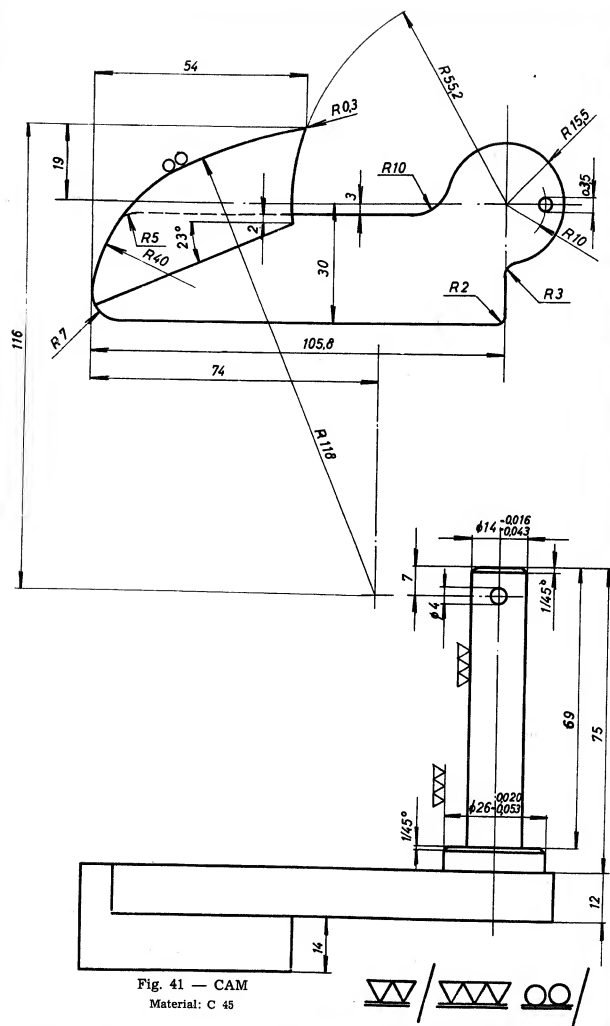


Fig. 41 — CAM
Material: C 45

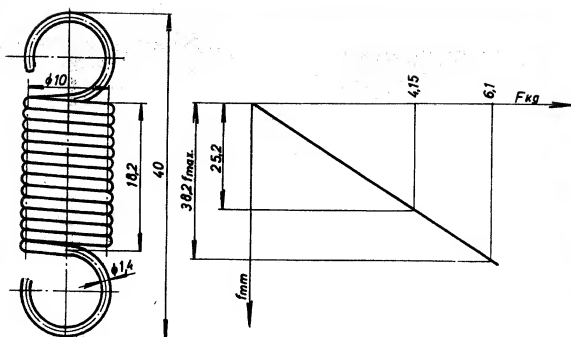


Fig. 42 — AUXILIARY TRIGGER LEVER SPRING
Material: Patent wire 180—200 kg/mm²

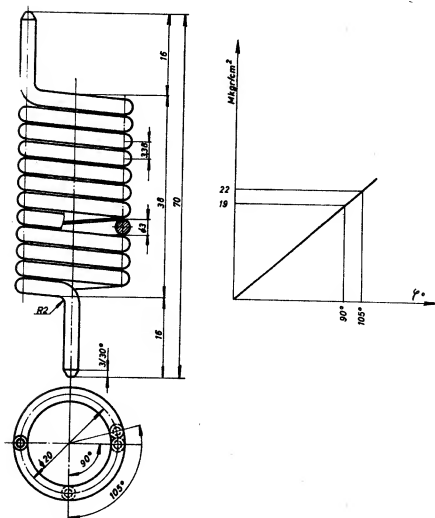


Fig. 43 — CAM RETURN SPRING
Material: Patent wire 160—180 kg/mm²

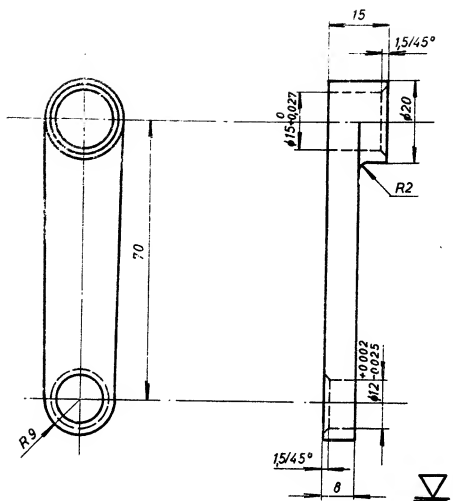
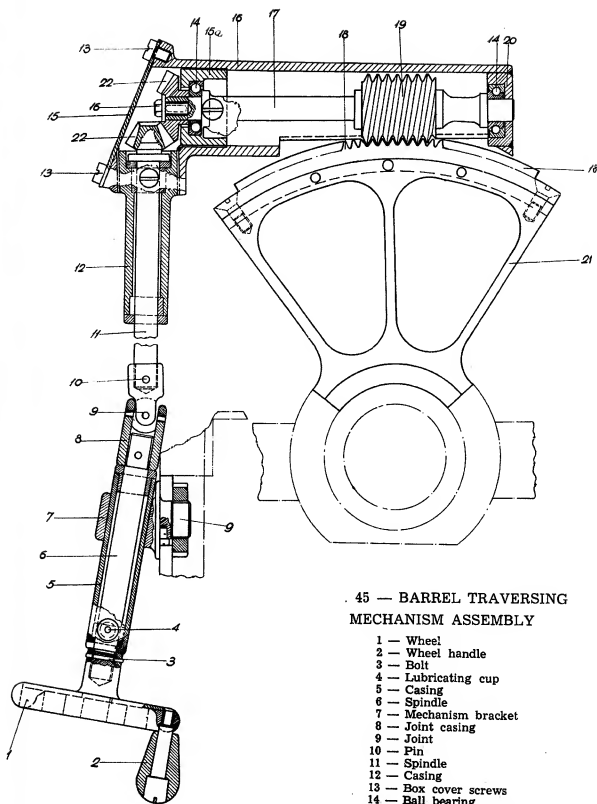
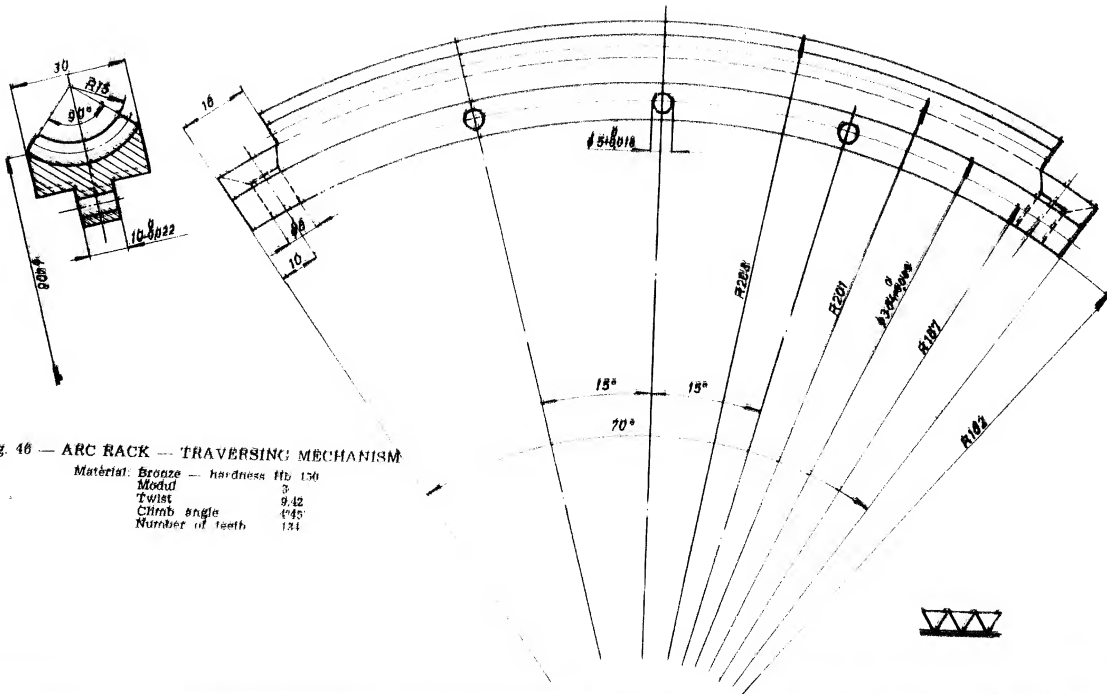


Fig. 44 — AUXILIARY TRIGGER HANDLE
Material: C 45



45 — BARREL TRAVERSING
MECHANISM ASSEMBLY

- 1 — Wheel
- 2 — Wheel handle
- 3 — Bolt
- 4 — Lubricating cup
- 5 — Casing
- 6 — Spindle
- 7 — Mechanism bracket
- 8 — Joint casing
- 9 — Joint
- 10 — Pin
- 11 — Spindle
- 12 — Casing
- 13 — Box cover screws
- 14 — Ball bearing
- 15 — Ball bearing support
- 16 — Worm box body
- 17 — Worm shaft
- 18 — Arc rack
- 19 — Worm
- 20 — Ball bearing support
- 21 — Arc rack support
- 22 — Disc shaped gear
- 22a — Bevel gear
- 23 — Bronze bushing



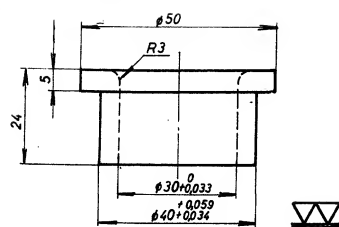


Fig. 47 — BRONZE SEATING
Material: Bearing bronze, hardness approx. Hb 150

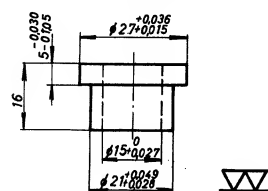


Fig. 48 — BRONZE SEATING
Material: Bearing bronze, hardness Hb 150

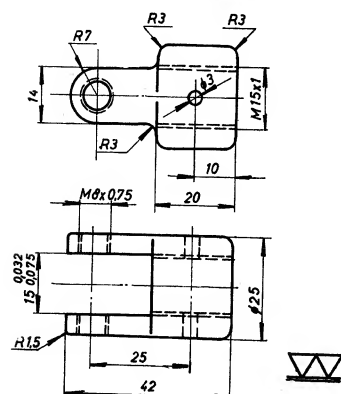


Fig. 49 — JOINT CASING
Material: C 60

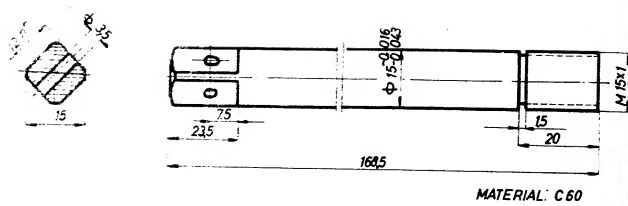


Fig. 50 — SPINDLE, BARREL TRAVERSING MECHANISM

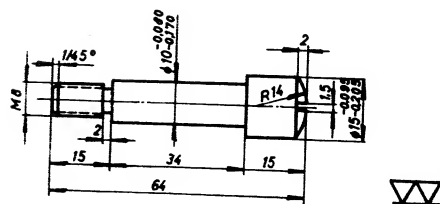


Fig. 51 — SCREW, WHEEL HANDLE

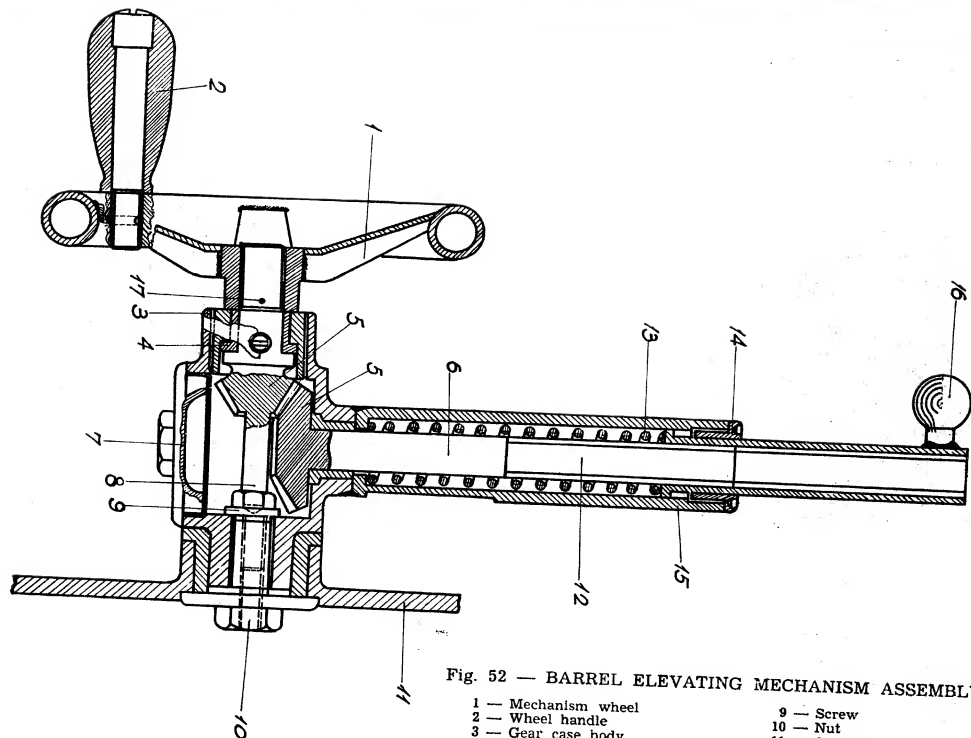


Fig. 52 — BARREL ELEVATING MECHANISM ASSEMBLY

- | | |
|----------------------------|-------------------------|
| 1 — Mechanism wheel | 9 — Screw |
| 2 — Wheel handle | 10 — Nut |
| 3 — Gear case body | 11 — Cartridge web |
| 4 — Bronze bushing | 12 — Guide |
| 5 — Disc shaped gear | 13 — Spring |
| 5a — Bevel gear | 14 — Bronze bearing |
| 6 — Disc shaped gear shaft | 15 — Casing |
| 7 — Casing cover | 16 — Casing with a knob |
| 8 — Bevel gear shaft | 17 — Pin |

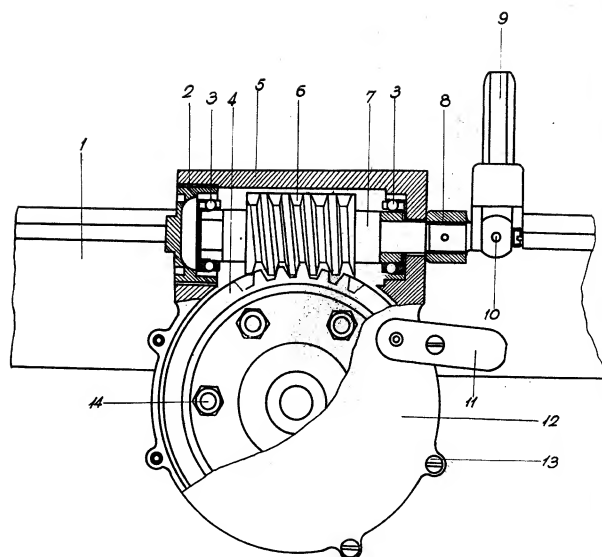


Fig. 53 — ELEVATING MECHANISM — WORM BOX ASSEMBLY

- Fig. 1. **SEPARATING MECHANISM** — **WORM BOX ASSEMBLY**
- | | |
|--------------------------|--|
| 1 — Cradle | 9 — Worm wheel shaft connector |
| 2 — Ball bearing support | 10 — Joint |
| 3 — Ball bearing | 11 — Worm wheel shaft connector fastener |
| 4 — Worm wheel | 12 — Box cover |
| 5 — Box body | 13 — Cover screws |
| 6 — Worm | 14 — Worm wheel screw |
| 7 — Worm wheel shaft | |
| 8 — Threaded bushing | |

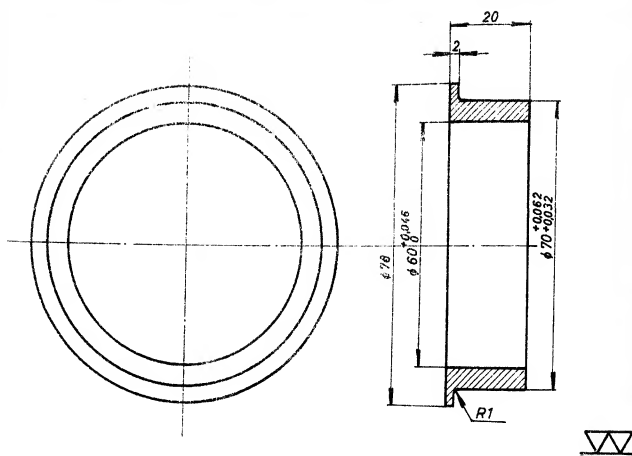


Fig. 54 — BRONZE BEARING — ELEVATING MECHANISM
SHAFT (BIG)

Material: Bearing bronze hardness Hb 150

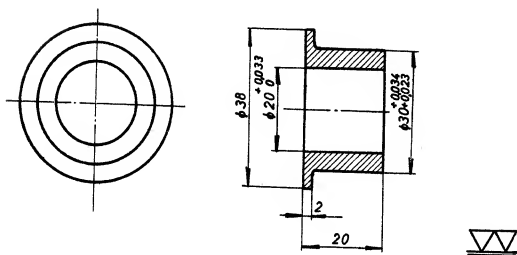


Fig. 55 — BRONZE BEARING — ELEVATING MECHANISM
SHAFT (SMALL)

Material: Bearing bronze hardness Hb 150

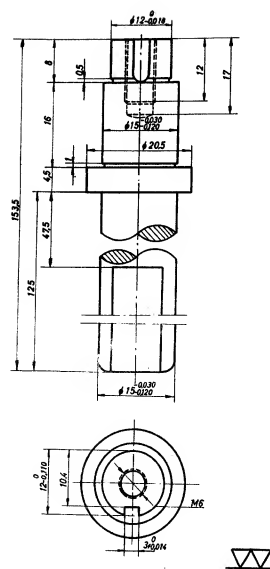


Fig. 56 — SPINDLE, ELEVATING MECHANISM
Material: C 45

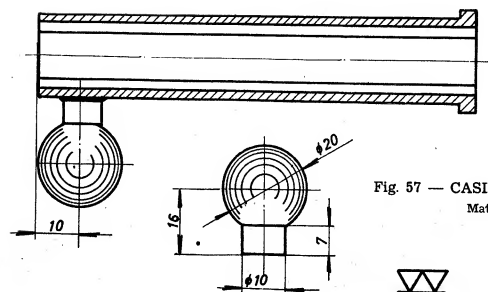


Fig. 57 — CASING WITH A KNOB
Material: Ms 58%

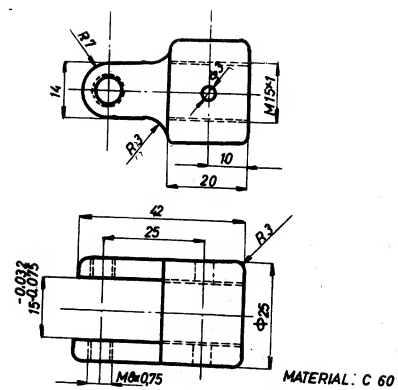


Fig. 58 — JOINT CASING

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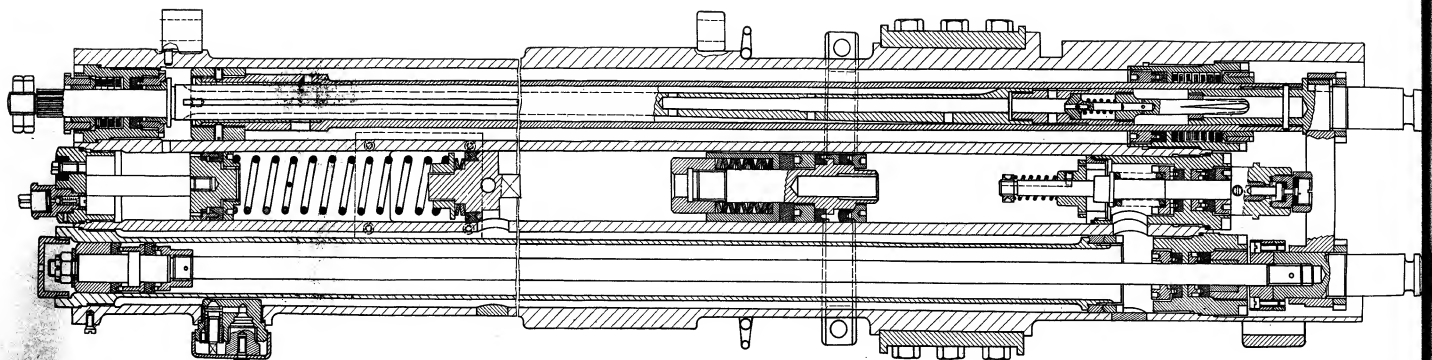


Fig. 59 — HYDRAULIC RECOIL BRAKE AND RECUPERATOR ASSEMBLY

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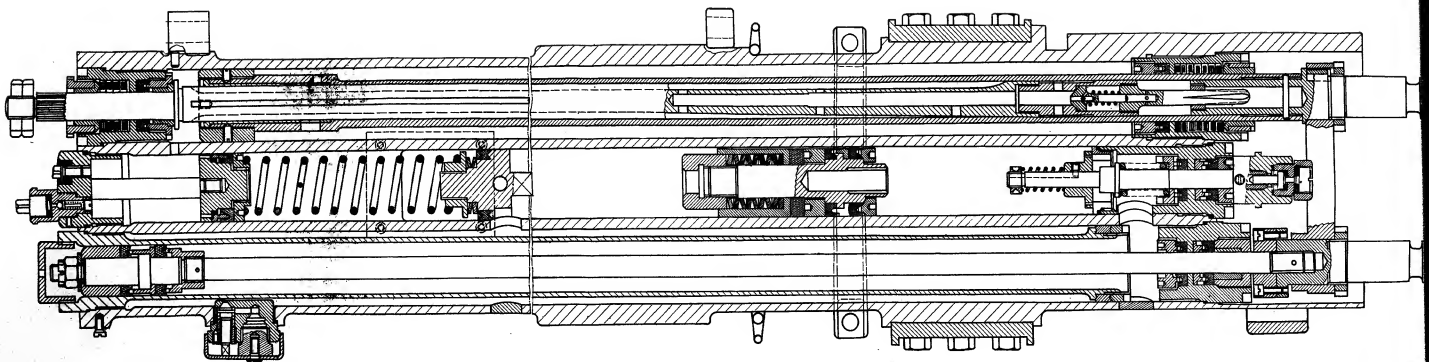


Fig. 59 — HYDRAULIC RECOIL BRAKE AND RECUPERATOR ASSEMBLY

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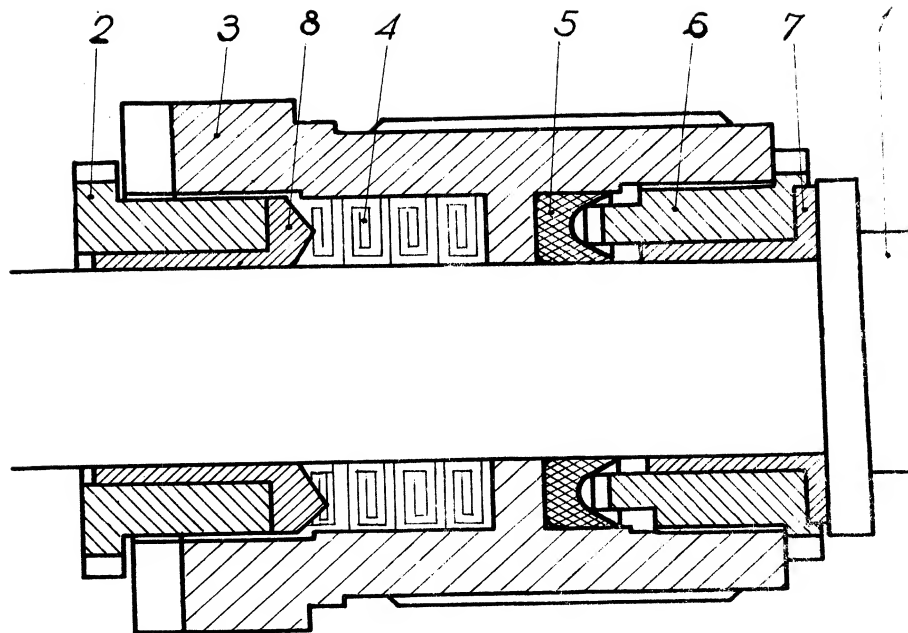


Fig. 60 — RECOIL BRAKE FRONT STUFFING BOX ASSEMBLY

- | | |
|-------------------------------|-------------------------|
| 1 — Counter recoil piston rod | 5 — Crimped rubber ring |
| 2 — Regulating nut | 6 — Nut |
| 3 — Stuffing box body | 7 — Bronze bushing |
| 4 — Tapered wick | 8 — Bronze pusher |

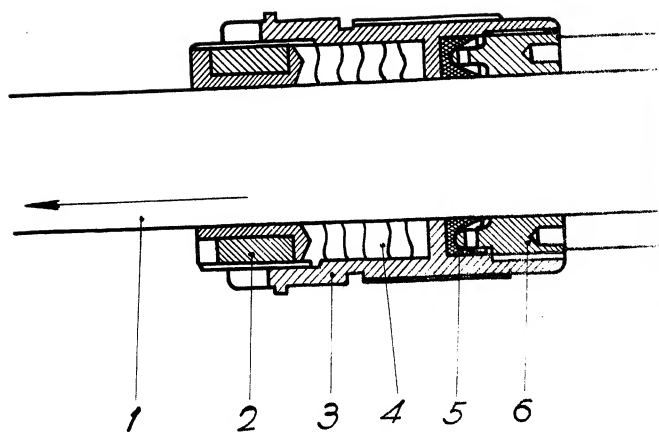


Fig. 61 — RECOIL BRAKE REAR STUFFING BOX ASSEMBLY

- | | |
|-----------------------------|-------------------------|
| 1 — Recoil brake piston rod | 4 — Tailowed wick |
| 2 — Nut | 5 — Crimped rubber ring |
| 3 — Stuffing box body | 6 — Nut |

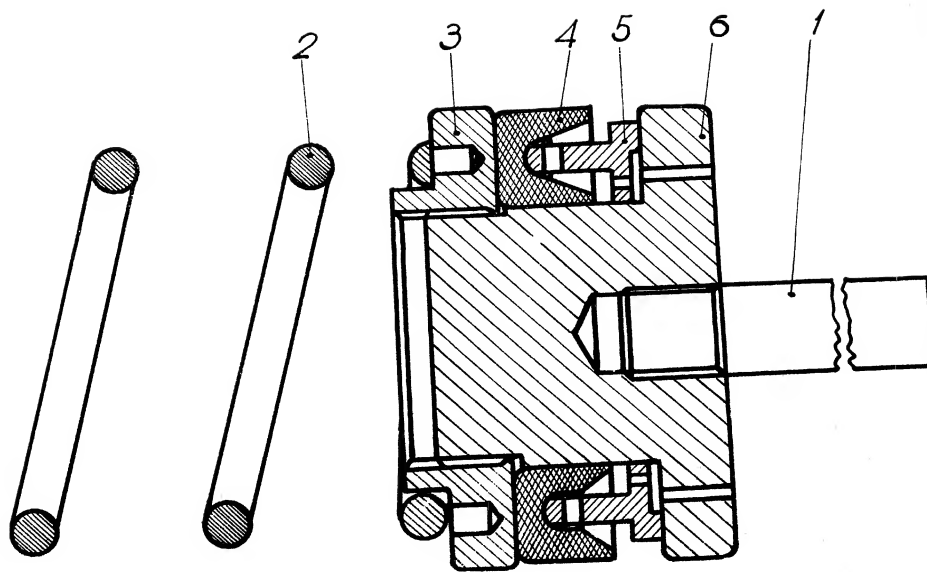


Fig. 62 — COMPENSATOR PISTON — ASSEMBLY

- | | |
|------------------------|-------------------------|
| 1 — Piston stop | 4 — Crimped rubber ring |
| 2 — Compensator spring | 5 — Crimped ring |
| 3 — Rest nut | 6 — Piston body |

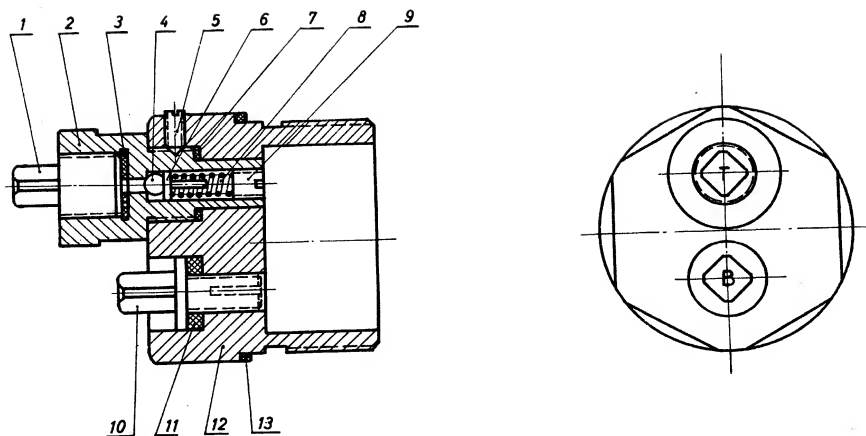


Fig. 63 — FLUID ADDING VALVE BOX — RECOIL BRAKE

- | | |
|-------------------------|-------------------------|
| 1 — Fluid valve plug | 8 — Valve spring |
| 2 — Valve body | 9 — Stop screw |
| 3 — Jointing | 10 — Air relasing valve |
| 4 — Pellet | 11 — Rubber jointing |
| 5 — Safety screw | 12 — Valve box body |
| 6 — Pellet pusher | 13 — Copper jointing |
| 7 — Valve body jointing | |

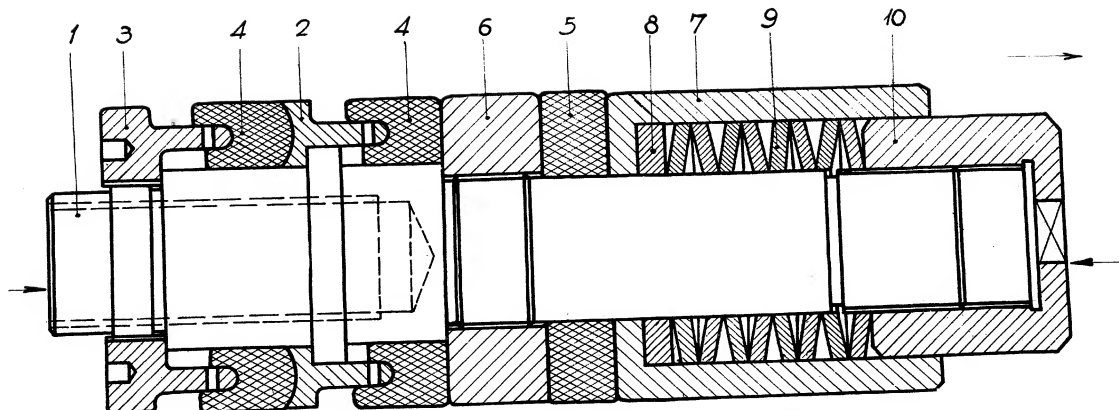


Fig. 64 — FLOATING PISTON

- | | |
|-------------------------|---------------------------|
| 1 — Piston body | 6 — Rest nut |
| 2 — Crimped ring | 7 — Bronze bushing |
| 3 — Nut | 8 — Washer |
| 4 — Crimped rubber ring | 9 — Bellville springs |
| 5 — Rubber jointing | 10 — Spring tightening nu |

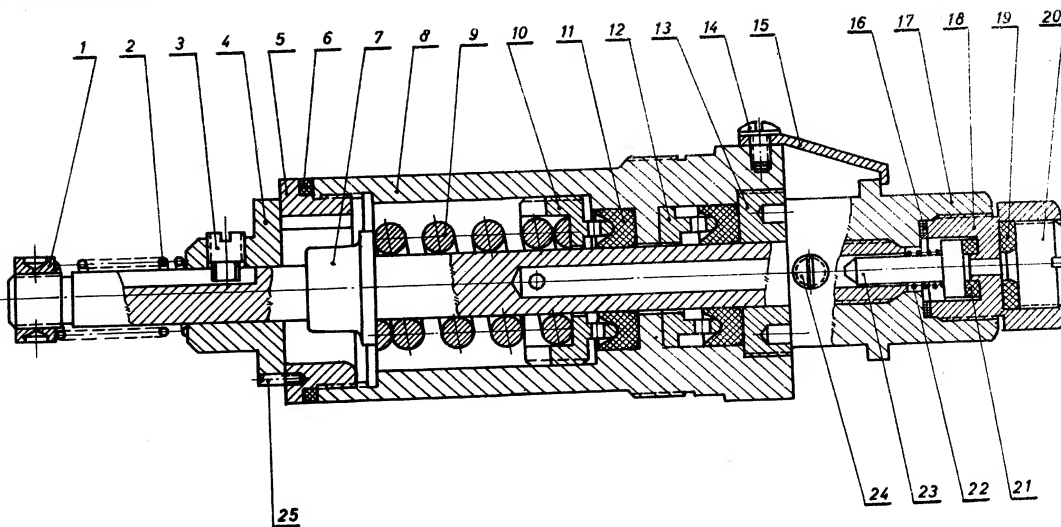


Fig. 65 — COUNTER RECOIL SPEED REGULATOR

- | | |
|------------------------------|-----------------------------|
| 1 — Nut | 14 — Screw |
| 2 — Spring | 15 — Indicator |
| 3 — Stop screw | 16 — Jointing |
| 4 — Valve | 17 — Regulator head |
| 5 — Nut | 18 — Fluid adding valve box |
| 6 — Jointing | 19 — Jointing |
| 7 — Regulator shaft | 20 — Plug |
| 8 — Regulator casing | 21 — Jointing |
| 9 — Spring | 22 — Spring |
| 10 — Crimped ring | 23 — Valve |
| 11 — Crimped rubber jointing | 24 — Safety screw |
| 12 — Under crimped ring | 25 — Stop screw |
| 13 — Nut | |

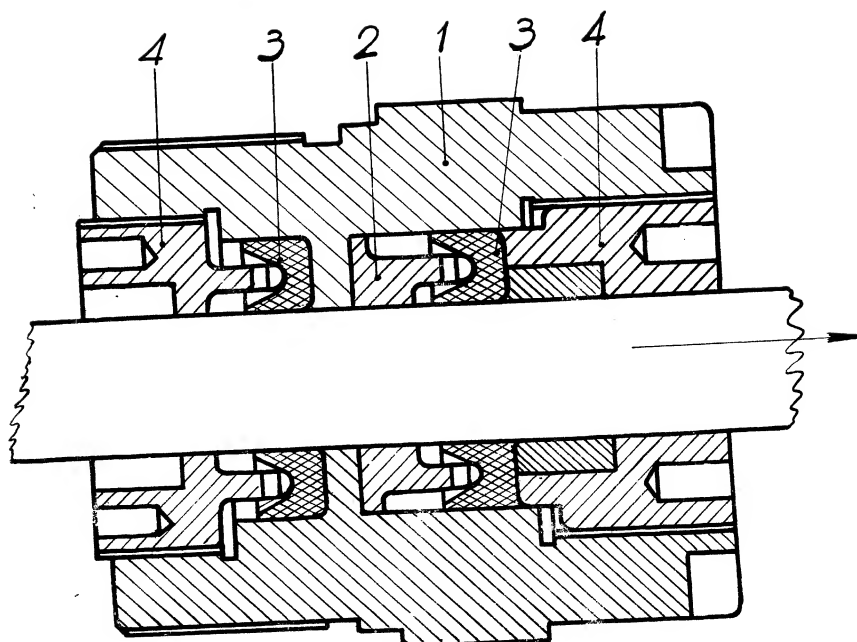


Fig. 66 — RECUPERATOR STUFFING BOX — ASSEMBLY

- | | |
|-------------------------|---------------------------|
| 1 — Box body | 4 — Nut |
| 2 — Under crimped ring | 5 — Nut with crimped ring |
| 3 — Crimped rubber ring | |

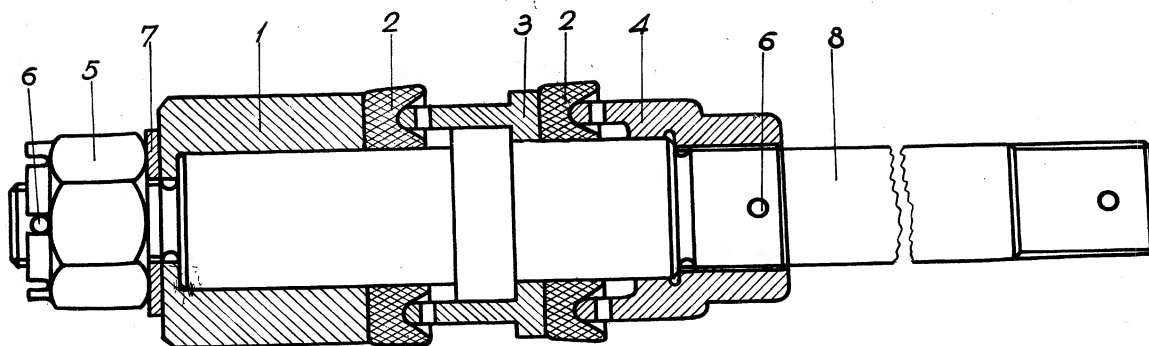
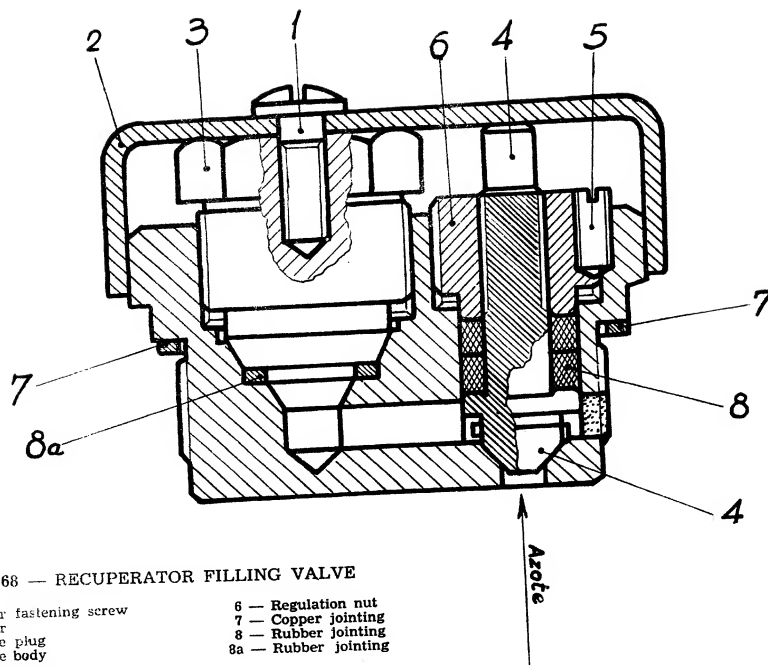


Fig. 67 — RECUPERATOR PISTON — ASSEMBLY

- | | |
|-----------------------------|----------------------------|
| 1 — Bronze guide | 5 — Piston nut |
| 2 — Crimped rubber jointing | 6 — Pin |
| 3 — Undercrimped ring | 7 — Washer |
| 4 — Jointing tightening nut | 8 — Recuperator piston rod |



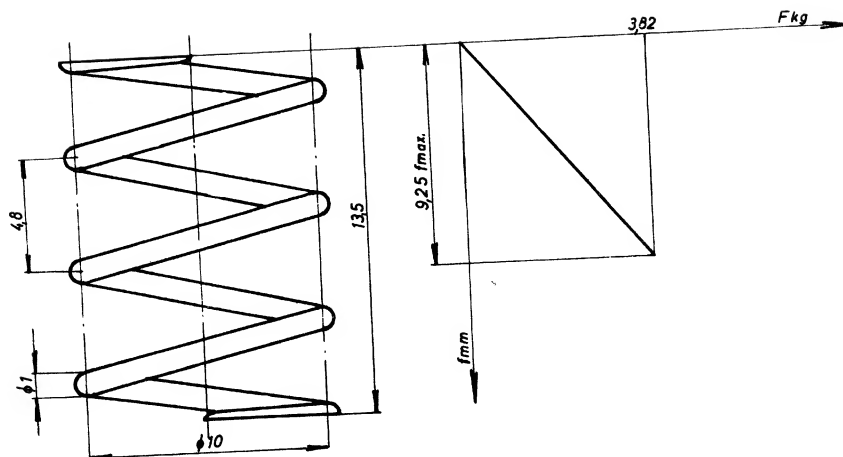


Fig. 69 — CONNECTOR FASTENER SPRING
Material: patent wire 160—180 kg/mm²

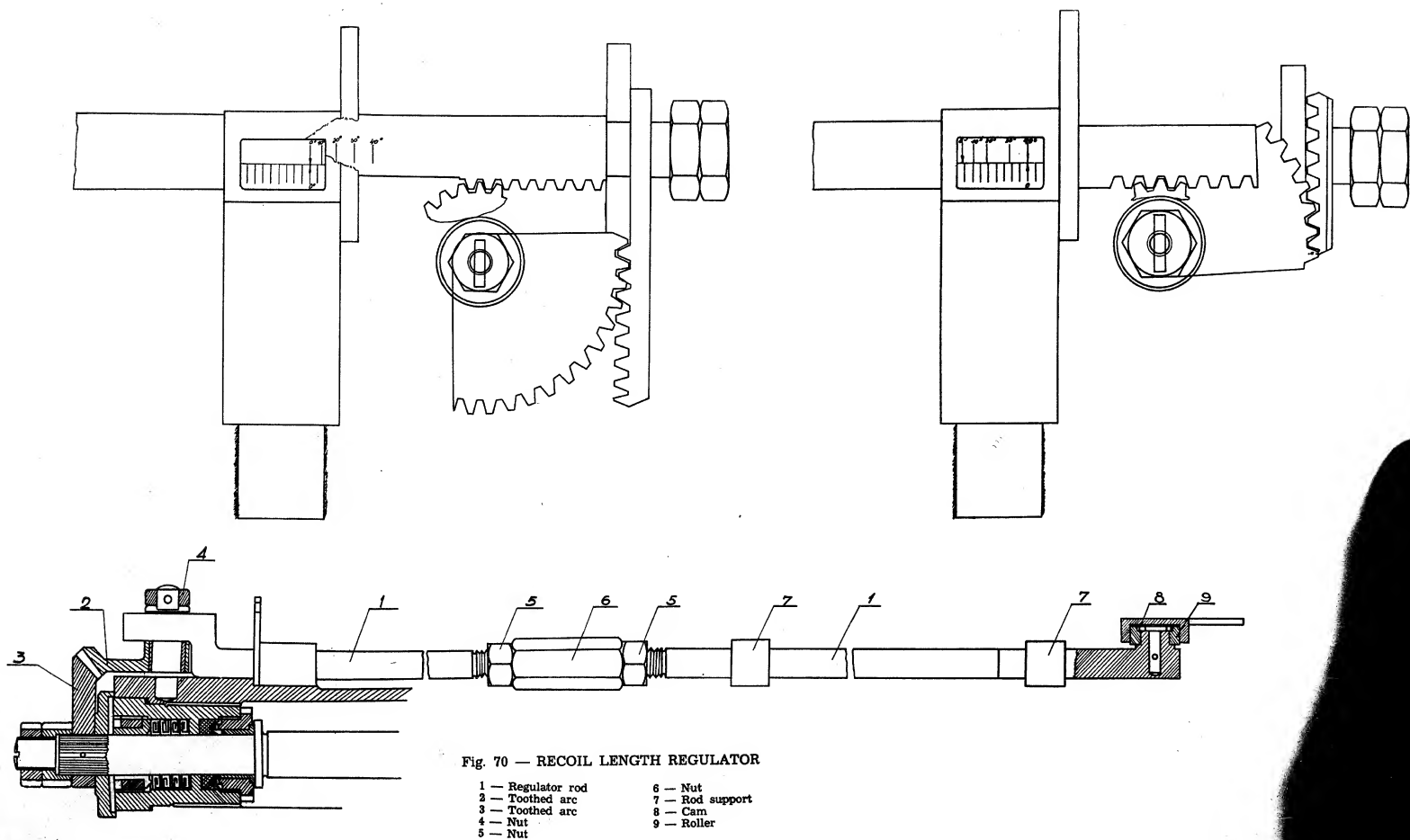


Fig. 70 — RECOIL LENGTH REGULATOR

- | | |
|-------------------|-----------------|
| 1 — Regulator rod | 6 — Nut |
| 2 — Toothed arc | 7 — Rod support |
| 3 — Toothed arc | 8 — Cam |
| 4 — Nut | 9 — Roller |
| 5 — Nut | |

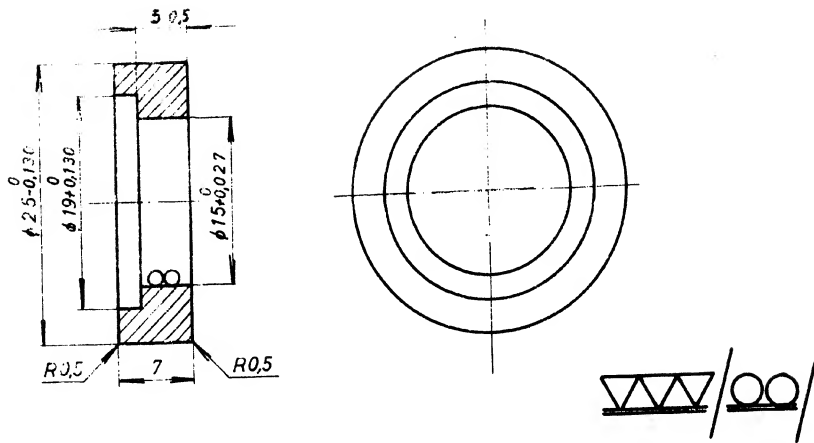


Fig. 71 — ROLLER
Material: C 50 — improved

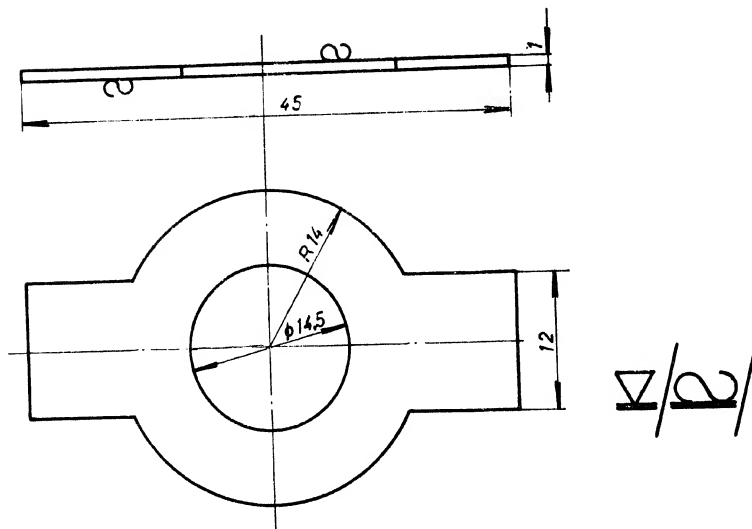
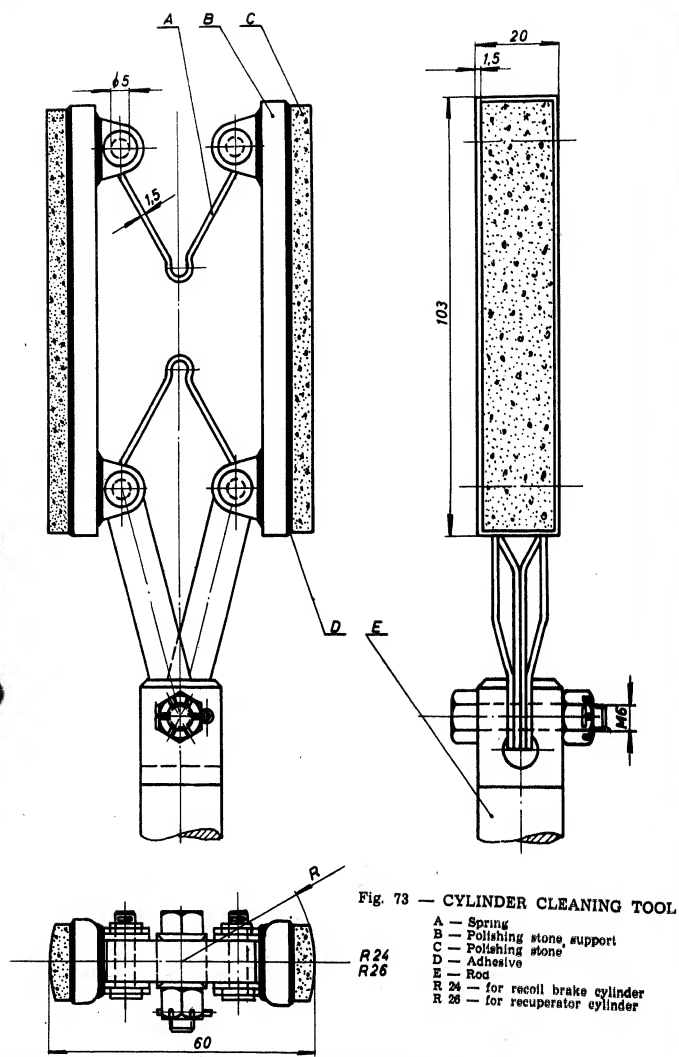


Fig. 72 — SHEET METAL SAFETY ELEMENT
Material: St 3722



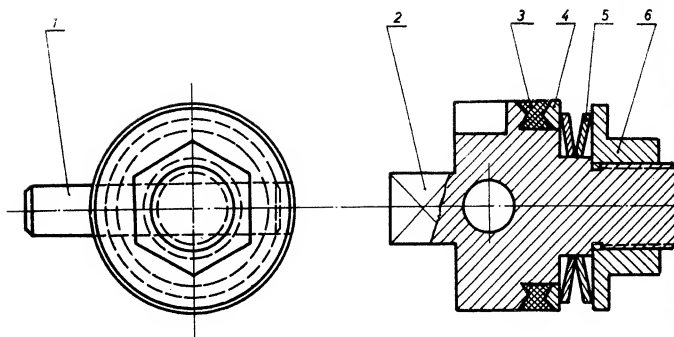
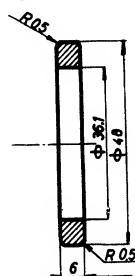


Fig. 74 — MIDDLE BULKHEAD — ASSEMBLY

- | | |
|---------------------|------------------------|
| 1 — Pin | 4 — Pressing ring |
| 2 — Bulkhead body | 5 — Belleville springs |
| 3 — Rubber jointing | 6 — Tightening nut |



MATERIAL: Perbunan Sh=75-80

Fig. 75 — RUBBER RING

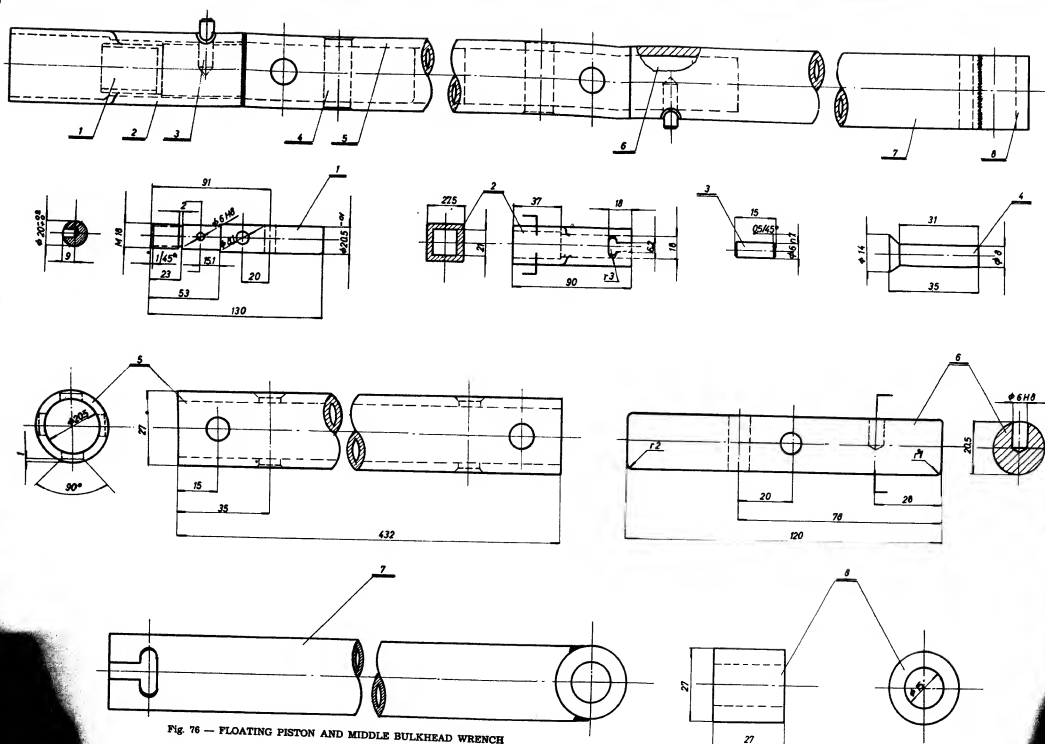


Fig 76 — FLOATING PISTON AND MIDDLE BULKHEAD WRENCH

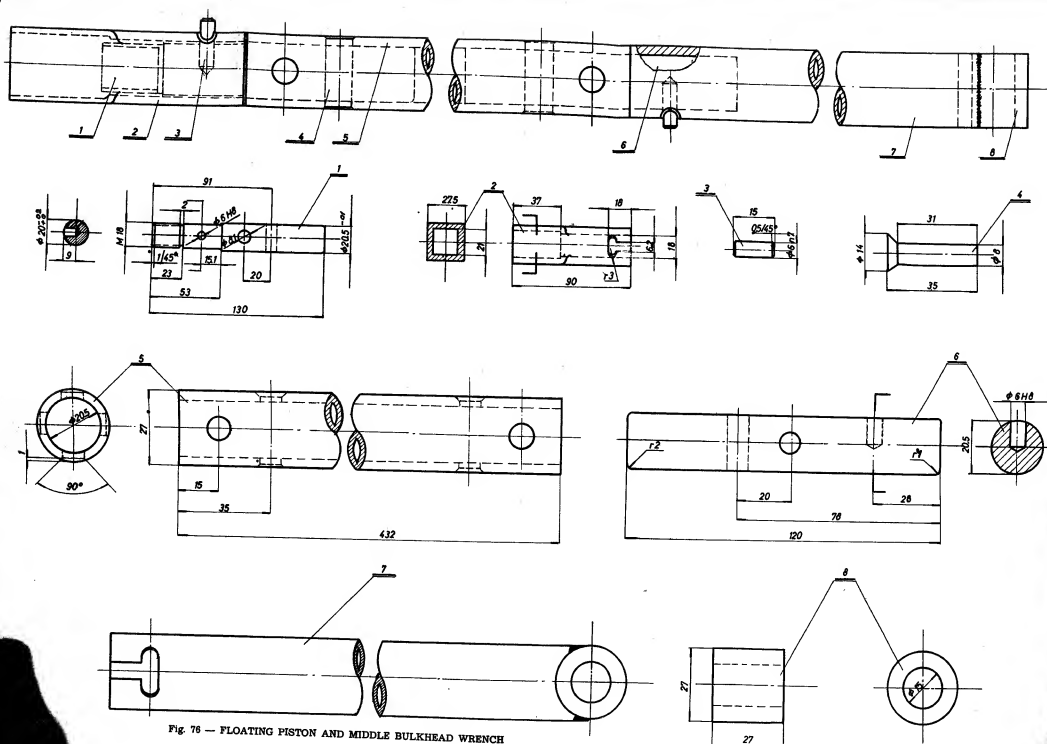
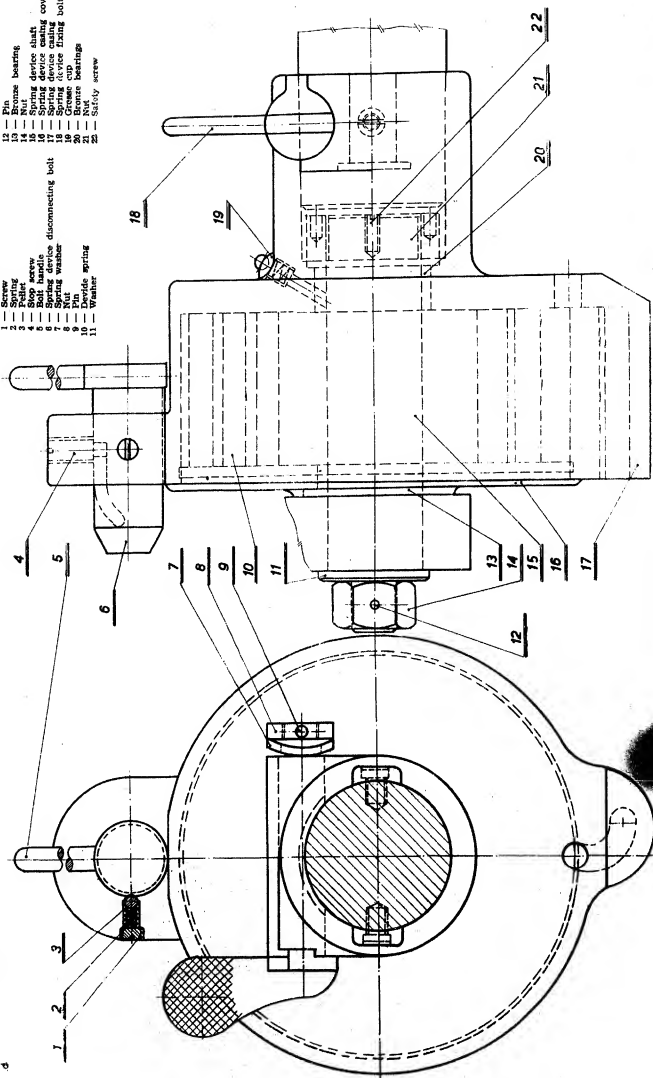


Fig. 76 — FLOATING PISTON AND MIDDLE BULKHEAD WRENCH

Fig. 79 — SPRING DEVICE GUN B-1 — ASSEMBLY

- 1 — Screw
- 2 — Pin
- 3 — Pin
- 4 — Pin
- 5 — Pin
- 6 — Pin
- 7 — Spring device
- 8 — Spring device
- 9 — Spring device
- 10 — Spring device
- 11 — Spring device
- 12 — Spring device
- 13 — Spring device
- 14 — Spring device
- 15 — Spring device
- 16 — Spring device
- 17 — Spring device
- 18 — Spring device
- 19 — Spring device
- 20 — Spring device
- 21 — Spring device
- 22 — Spring device



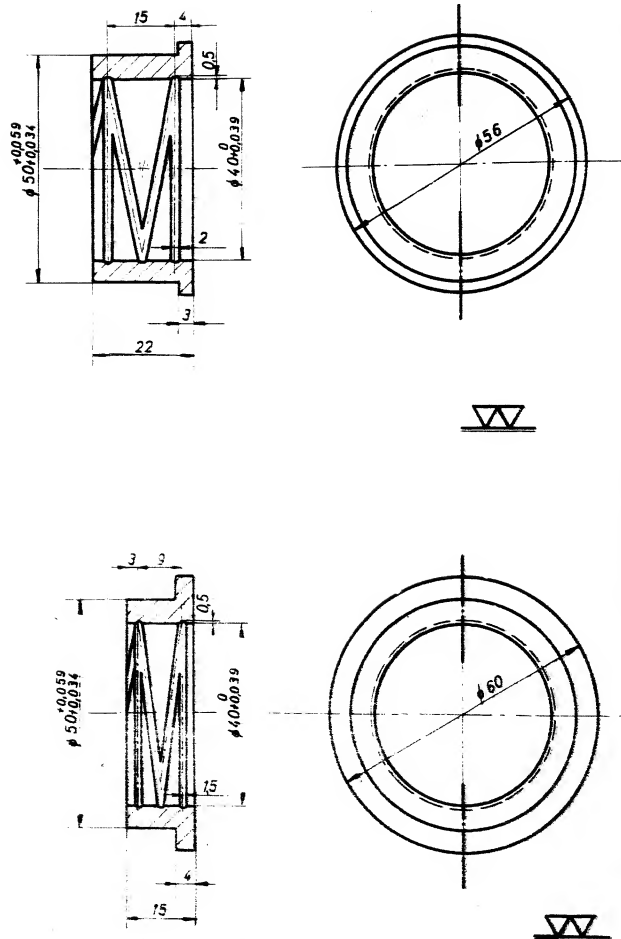


Fig. 30 — BRONZE BEARINGS — SPRING DEVICE

a. Casing bearing

b. Cover bearing

Material: Bearing bronze, hardness Hb 150

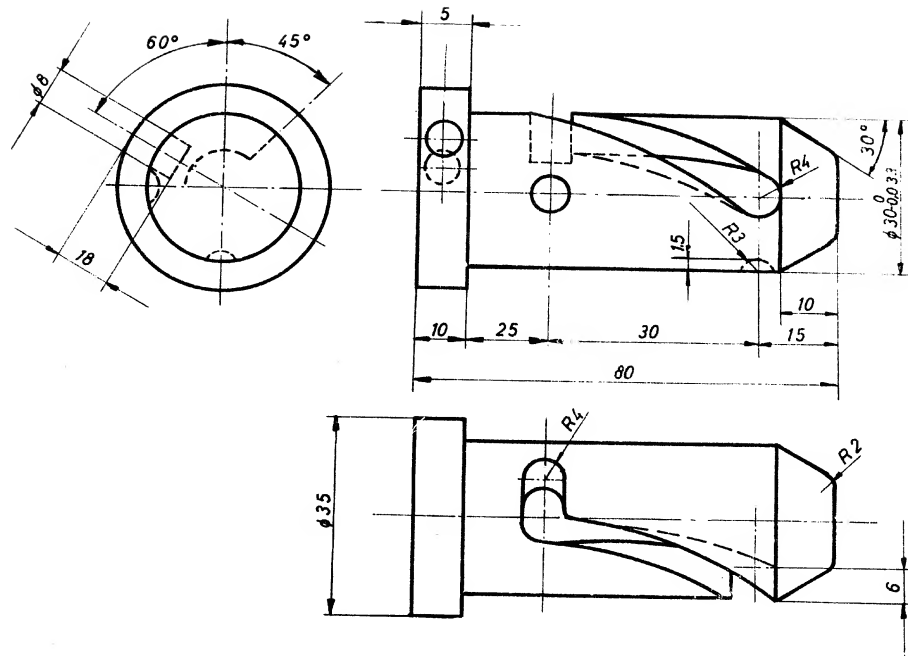


Fig. 81 — SPRING DEVICE DISCONNECTING BOLT -- LEFT
Material: FLW 1452.4(3)

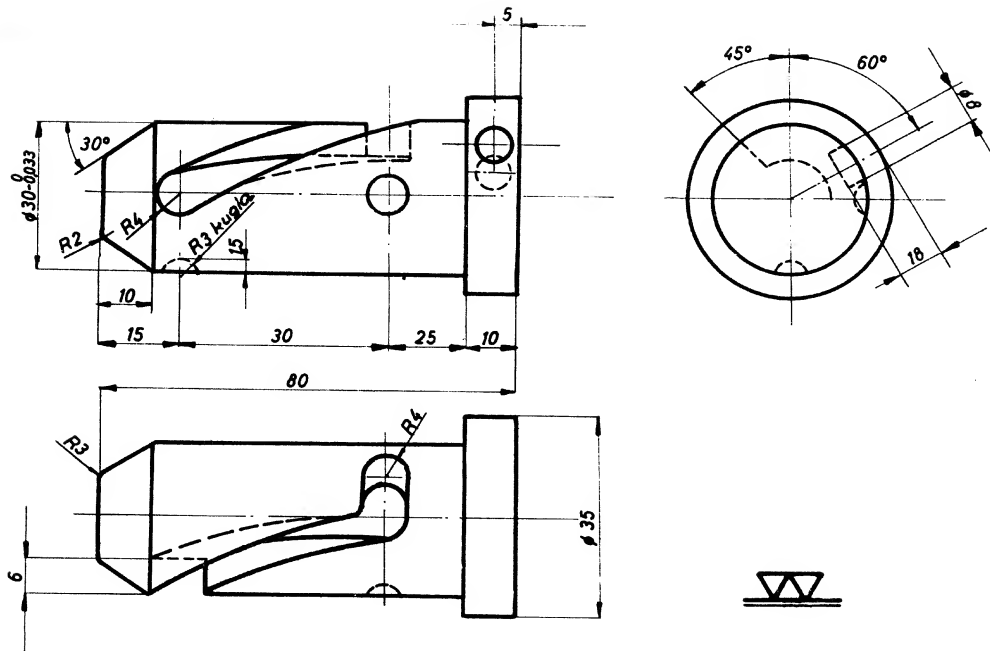


Fig. 82 — SPRING DEVICE DISCONNECTING BOLT — RIGHT
Material: FLW 1462.4(3)

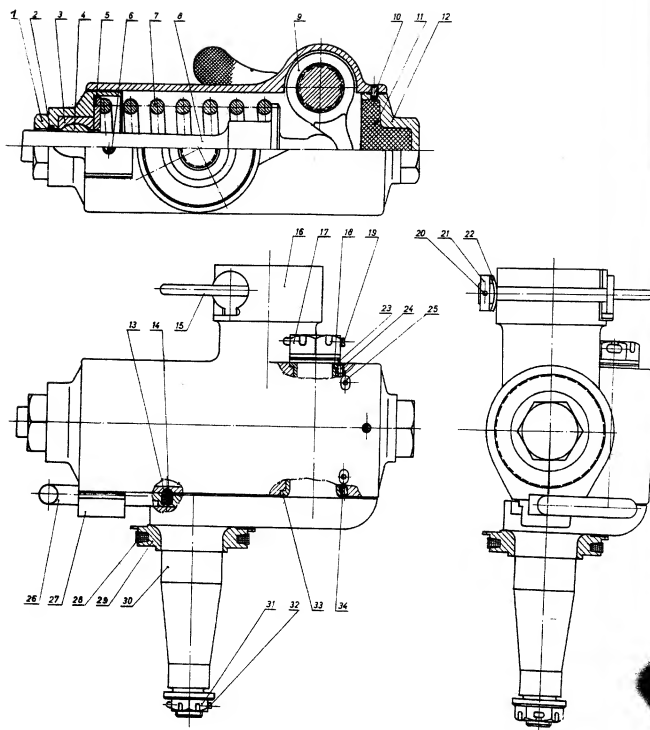


Fig. 83 — SPRING DEVICE — GUN B1-A2

- | | |
|--------------------------------------|---|
| 1 — Spring device casing front cover | 19 — Cotter pin |
| 2 — Felt wiper | 20 — Pin |
| 3 — Two part bronze bearings | 21 — Disc |
| 4 — Bronze bearing two part ball | 22 — Spring washer |
| 5 — Washer | 23 — Washer |
| 6 — Safety screw | 24 — Fastening screw |
| 7 — Device spring | 25 — Grease cup |
| 8 — Device spring guide shaft | 26 — Spring device disconnecting bolt |
| 9 — Guide pusher | 27 — Spring device disconnecting bolt slide |
| 10 — Safety screw | 28 — Felt jointing |
| 11 — Rubber buffer | 29 — Felt jointing support |
| 12 — Rear cover | 30 — Semi-axle |
| 13 — Fastener spring | 31 — Wheel tightening nut |
| 14 — Semi-round fastener | 32 — Cotter pin |
| 15 — Device fixing bolt | 33 — Bronze bearing |
| 16 — Spring device casing | 34 — Fastening screw |
| 17 — Semi axle nut | |
| 18 — Bronze bearing | |

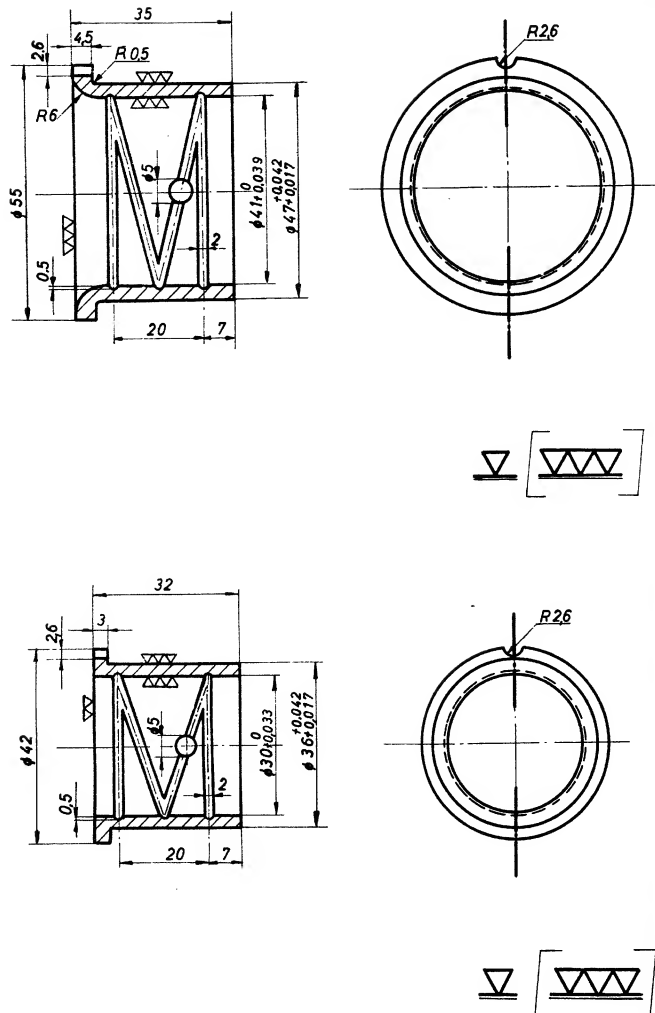


Fig. 84 — SPRING DEVICE CASING BRONZE BEARINGS

Material: Bearing bronze, hardness
Hb — 150

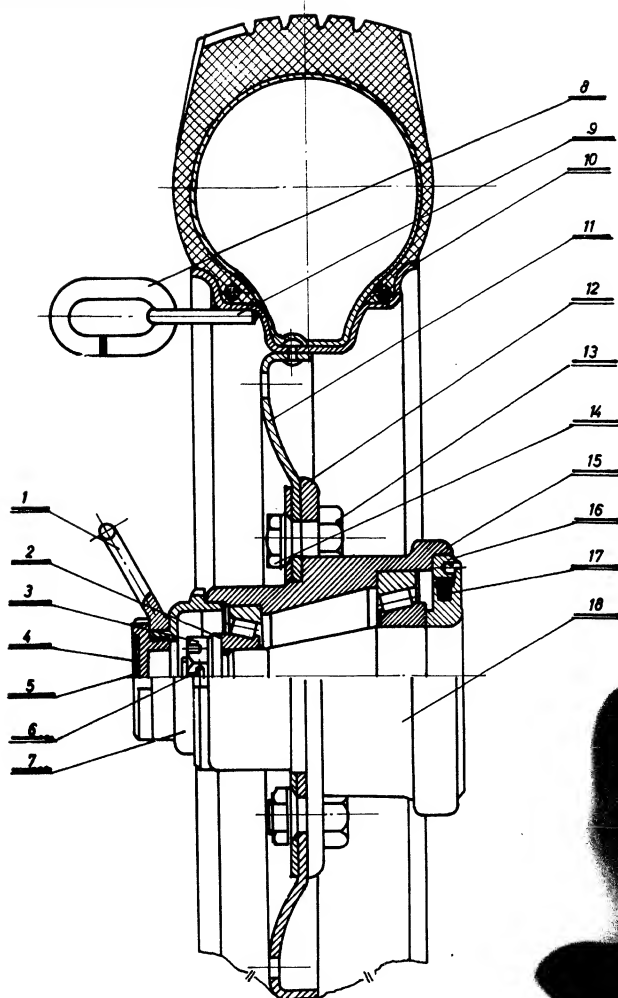


Fig. 85 — WHEEL GUN B-1 A1-I

- | | |
|--------------------------|-----------------------|
| 1 — Towing lunette | 10 — Rim |
| 2 — Ball bearing | 11 — Disc |
| 3 — Nut | 12 — Hub |
| 4 — Cover safety element | 13 — Hub screw |
| 5 — Cover | 14 — Nut |
| 6 — Cotter pin | 15 — Roller bearing |
| 7 — Lunette support | 16 — Ring |
| 8 — Pack loading link | 17 — Felt ring |
| 9 — Fastener | 18 — Felt ring suport |

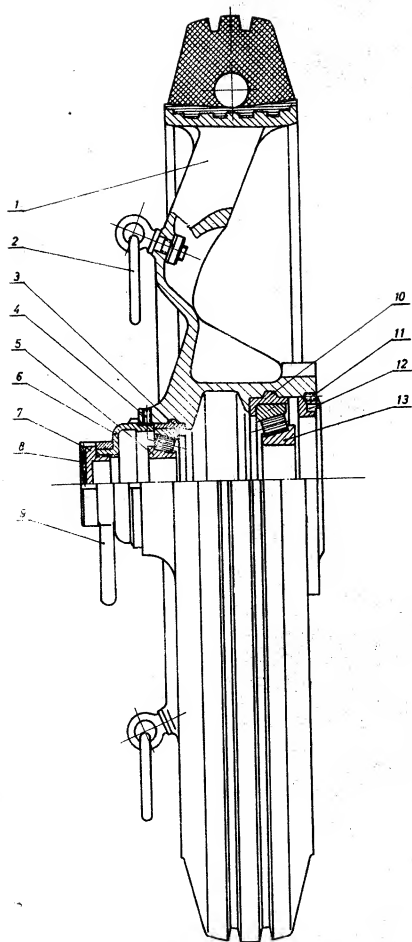


Fig. 86 - WHEEL GUN B-1 A-2

- | | |
|----------------------------|---------------------------|
| 1 - Wheel body | 8 - Spring safety element |
| 2 - Pack loading link | 9 - Towing lug |
| 3 - Steel bushing | 10 - Steel bushing |
| 4 - Hub cap safety screw | 11 - Fastening screw |
| 5 - Roller bearing - small | 12 - Bronze ring |
| 6 - Hub cap | 13 - Roller bearing - big |
| 7 - Cap cover | |

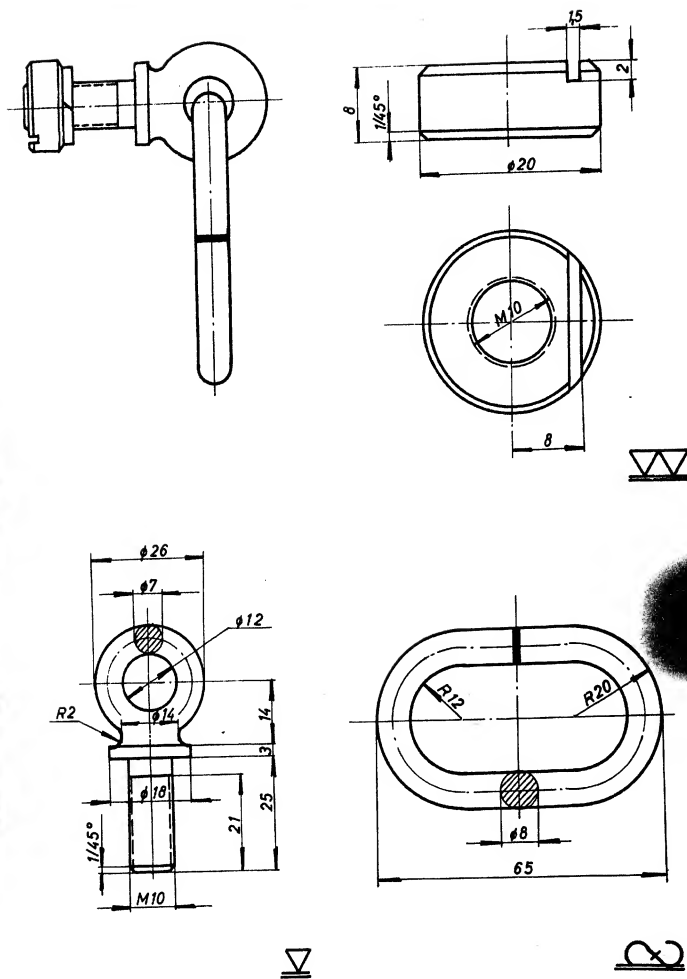


Fig. 87 — PACK LOADING LINK — ASSEMBLY

Material: C 45

Material: C 35

Material: C 22

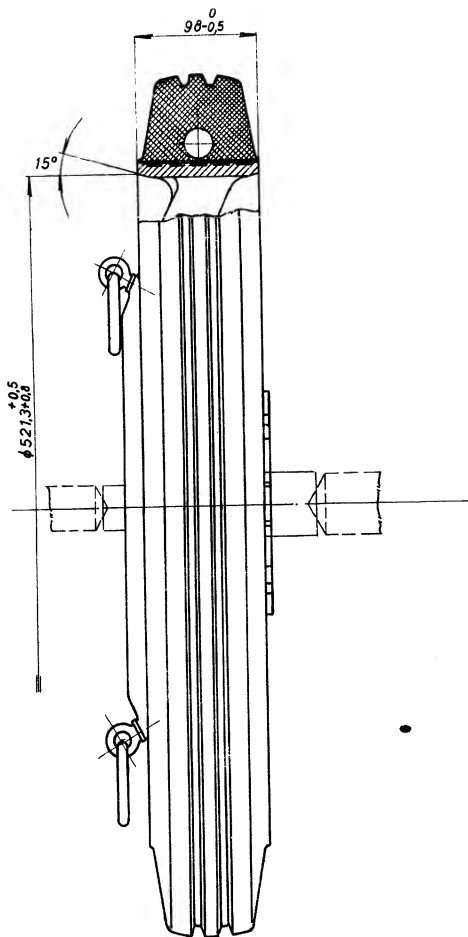
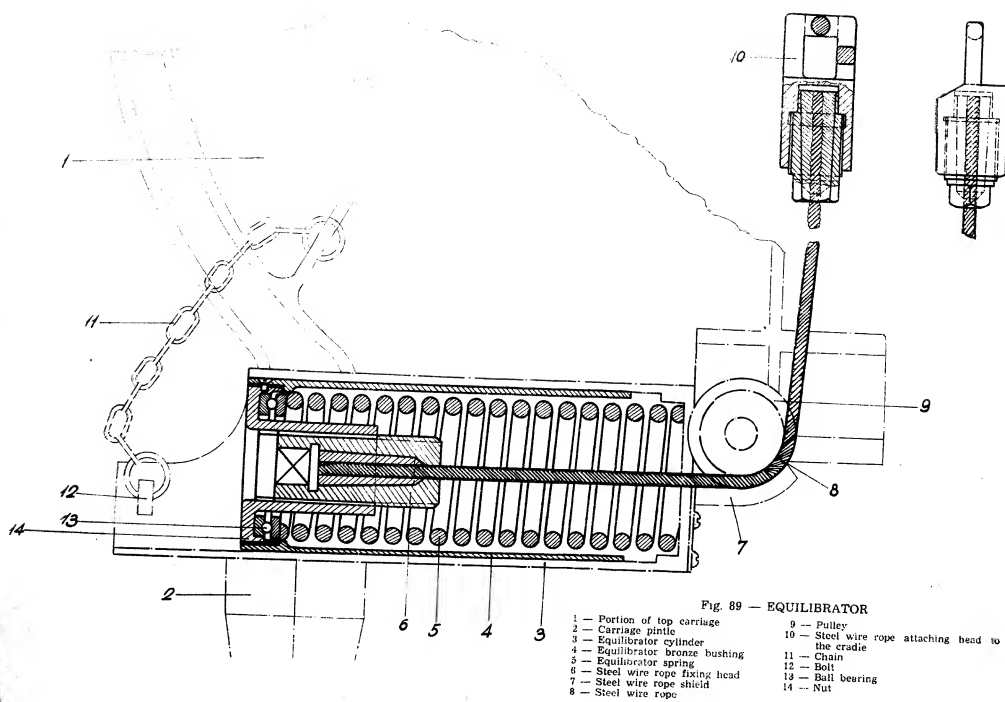
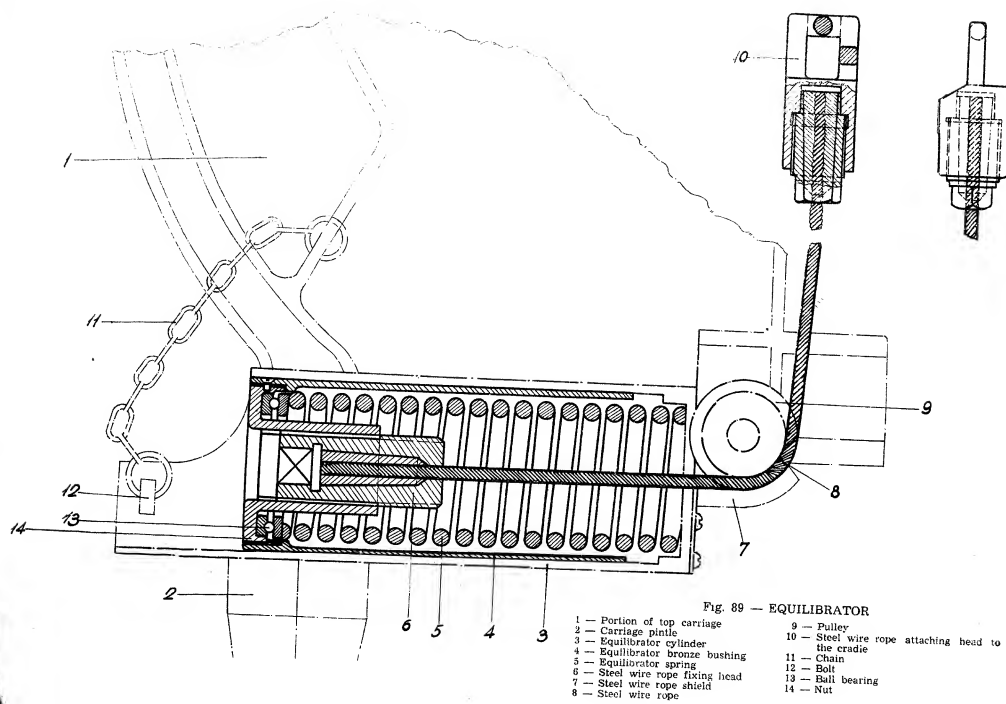


Fig. 88 — WHEEL GUN B1 A-2 — BODY
(Prior to vulcanization control dimensions)





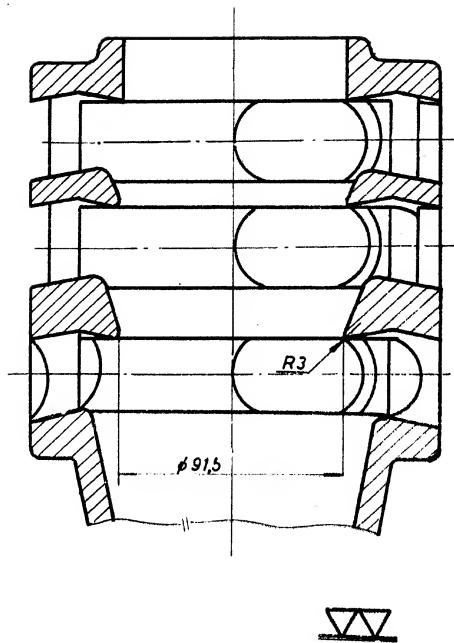


Fig. 90 — MUZZLE BRAKE

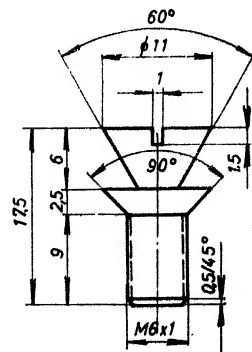


Fig. 93 — SLIDES FIXING SCREW — IN THE MANTLE
Material: Ms 58%

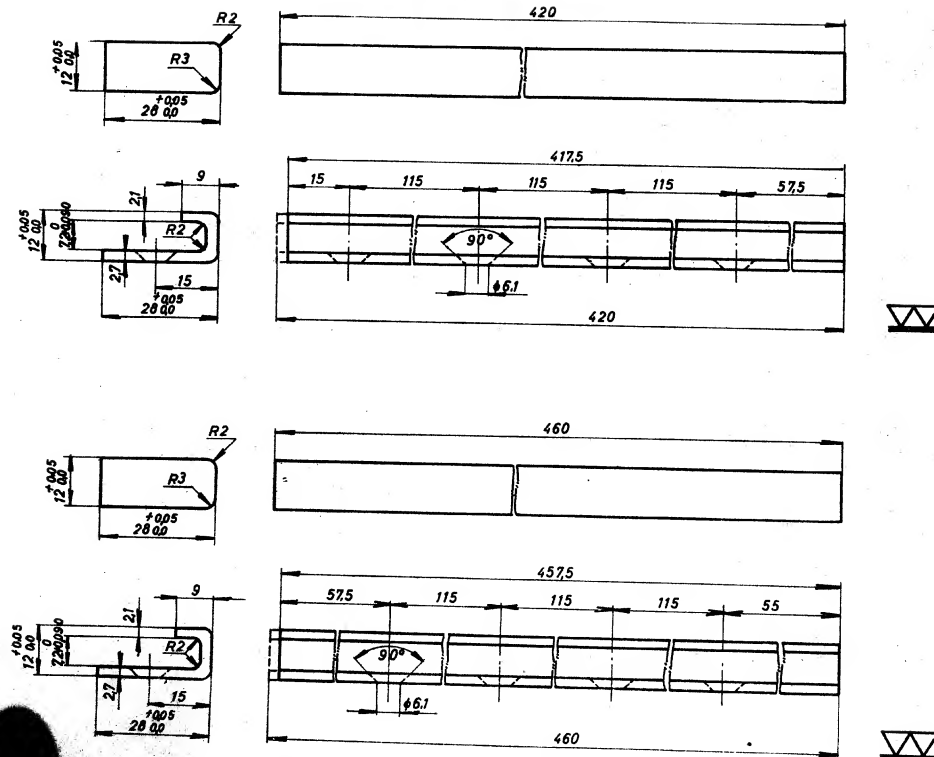


Fig. 91 — MANTLE BRONZE SLIDES

Material: Bearing bronze, hardness Hb 150

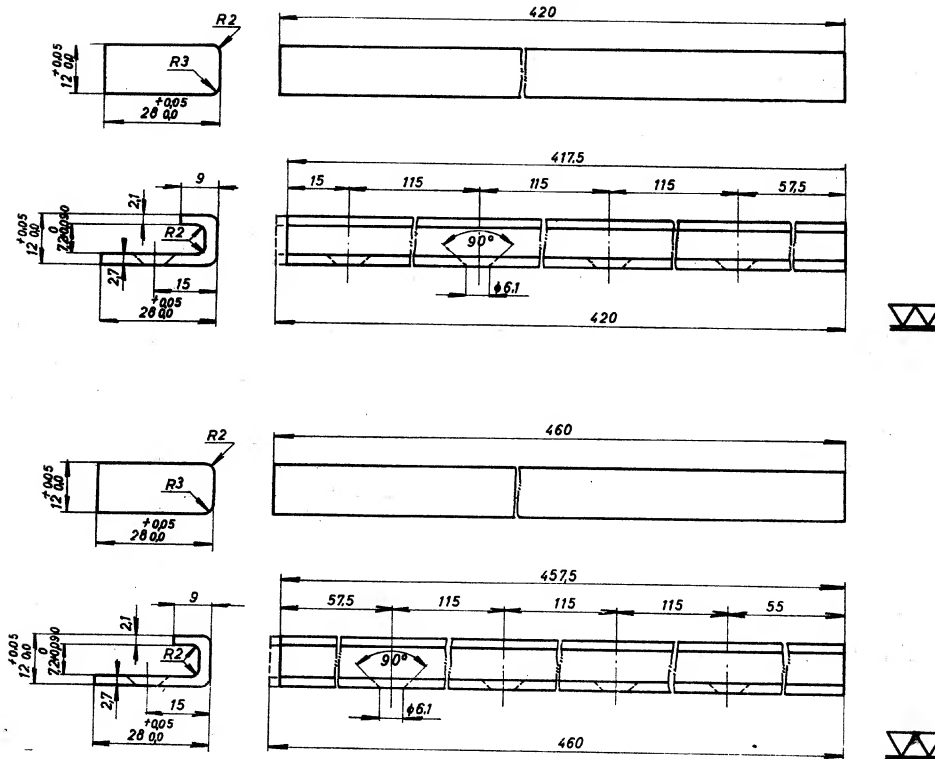


Fig. 91 — MANTLE BRONZE SLIDES

Material: Bearing bronze, hardness Hb 150

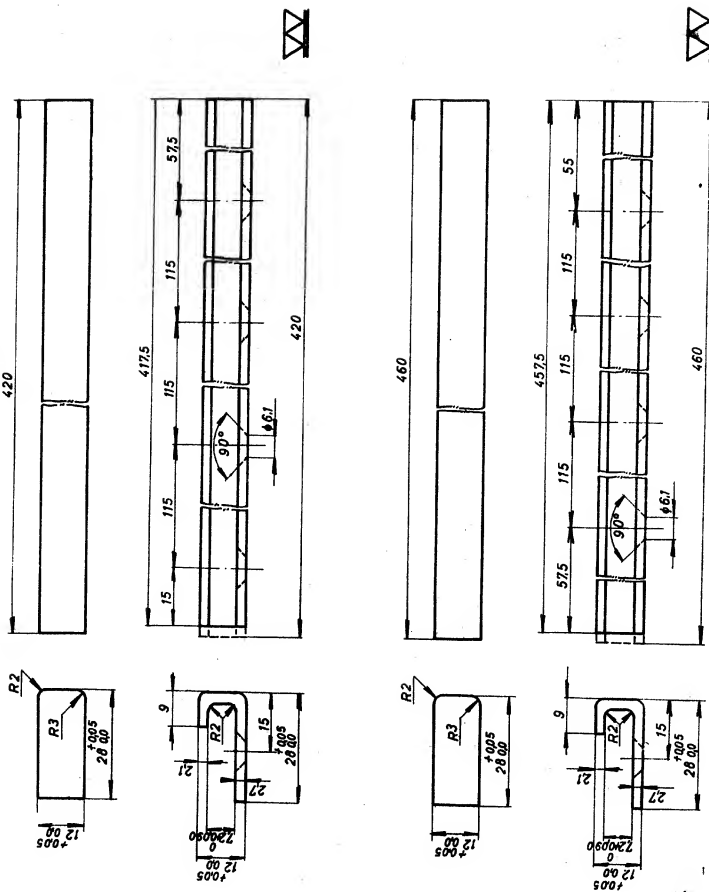


Fig. 91 — MANTLE BRONZE SLIDES
Material: Bearing bronze, hardness Hb 150

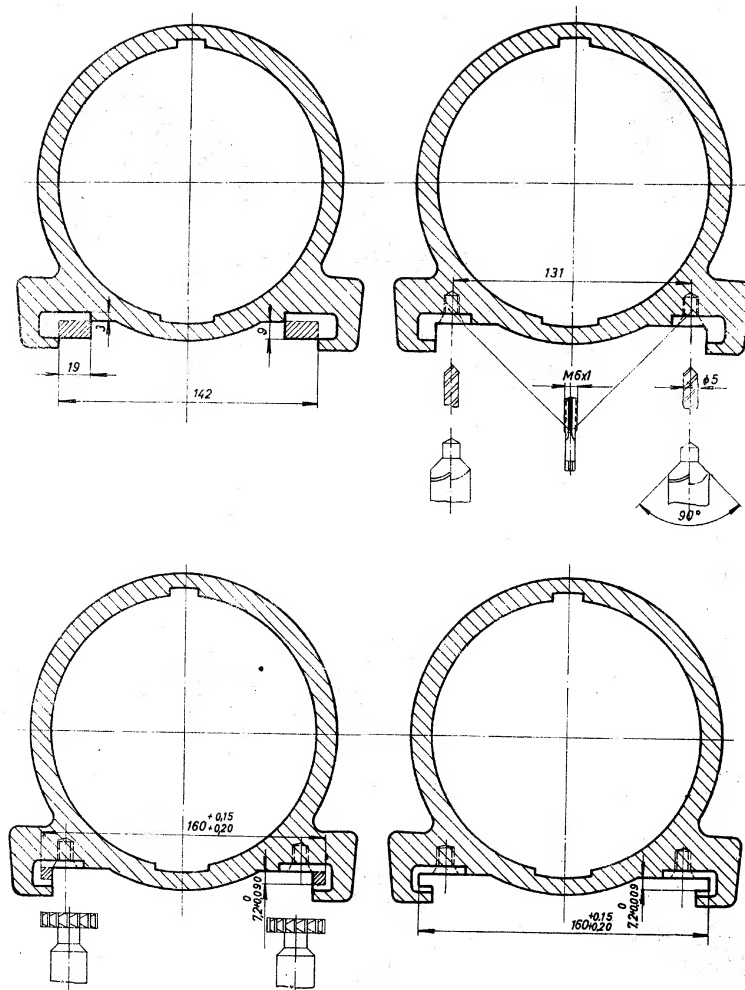


Fig. 92 — SETTING THE SLIDES INTO THE MANTLE

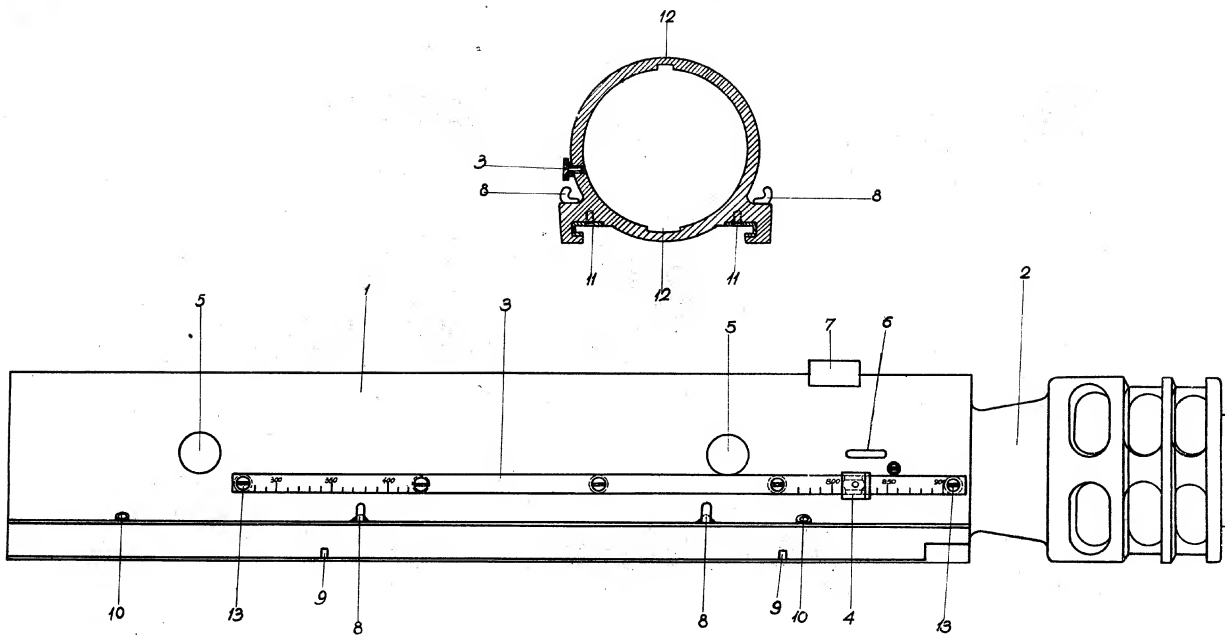
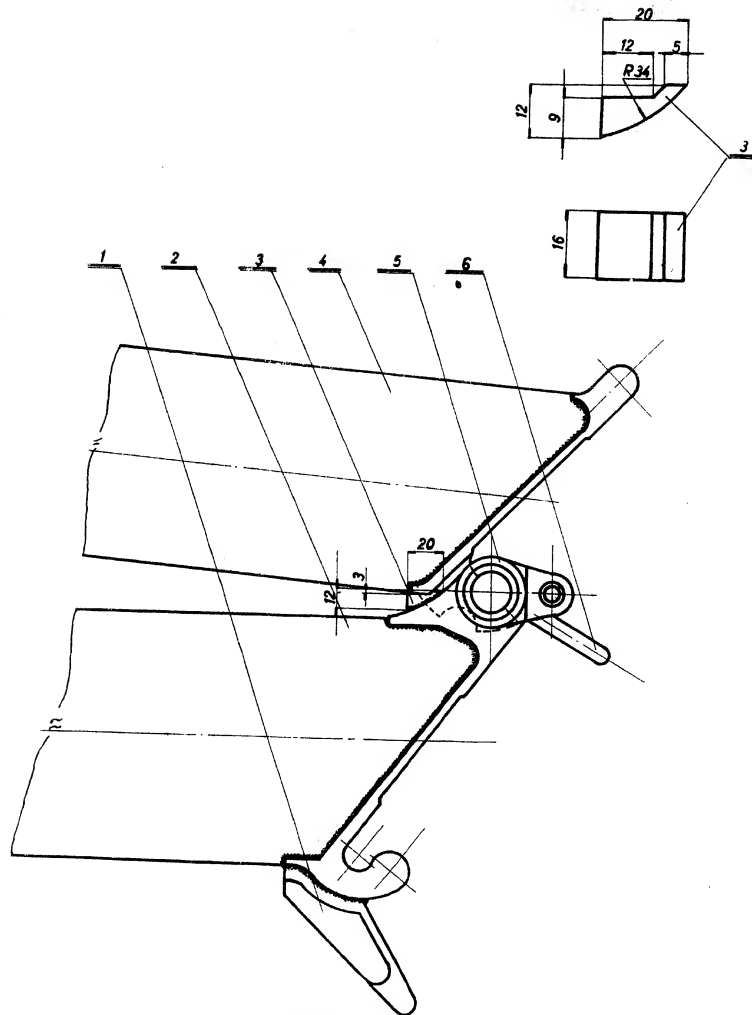


Fig. 94 — MANTLE WITH THE MUZZLE BRAKE — ASSEMBLY

- | | |
|-------------------------|--|
| 1 — Mantle | 8 — Packing hook |
| 2 — Muzzle brake | 9 — Pack saddle seating |
| 3 — Recoil length scale | 10 — Grease cups |
| 4 — Recoil length index | 11 — Slides brass screws |
| 5 — Holes on the mantle | 12 — Barrel guide grooves |
| 6 — Recess | 13 — Recoil length scale fixing screws |
| 7 — Front sight | |



- Fig. 95 — CARRIAGE TRAILS CONNECTION
- | | |
|-------------------|------------------|
| 1 — Spade | 4 — Rear section |
| 2 — Front section | 5 — Bolt |
| 3 — Washer | 6 — Bolt handle |

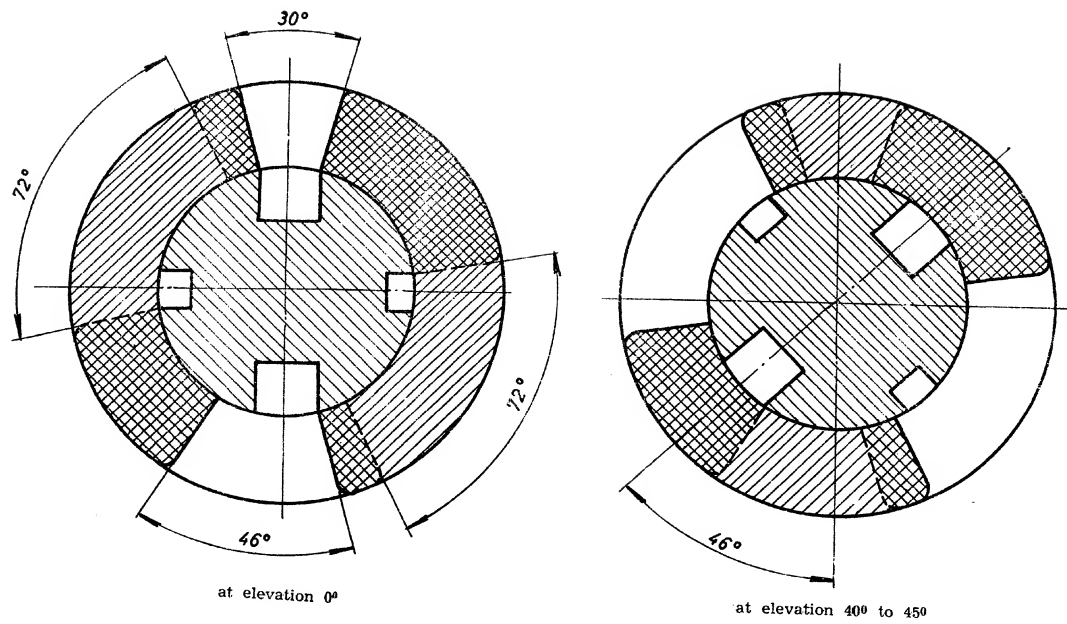


Fig. 96 — CORRECT POSITION OF THE COUNTER PISTON ROD

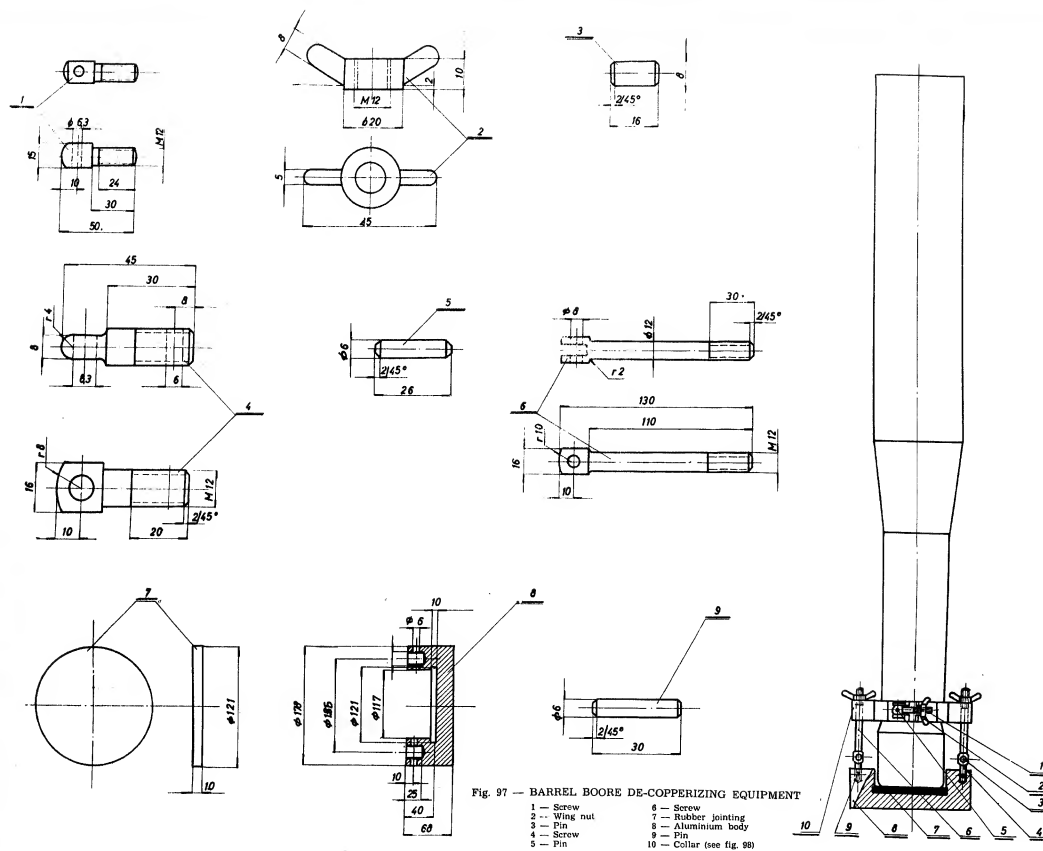
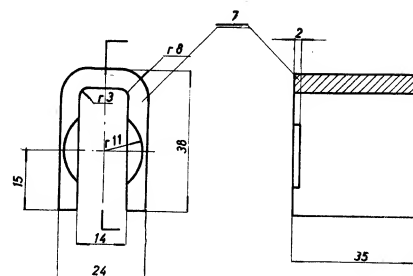
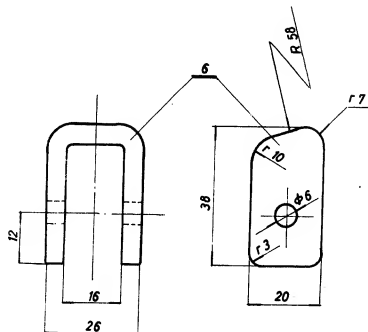
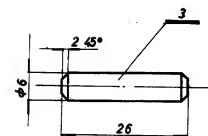
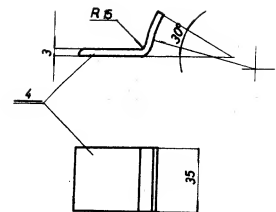
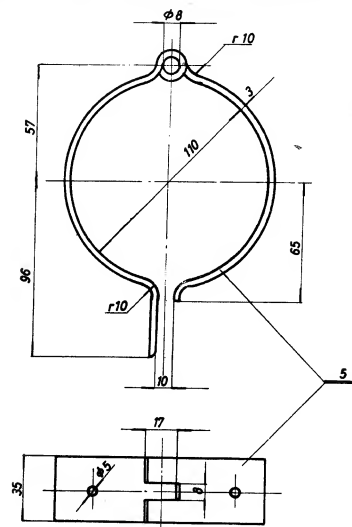
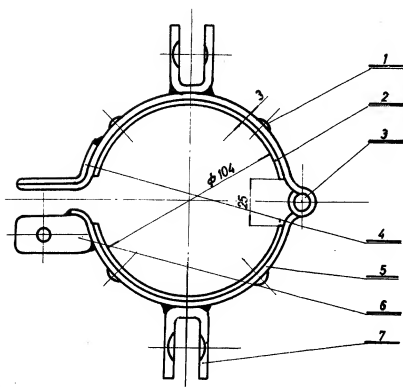


Fig. 98 — COLLAR, BARREL BORE DE-COPPERIZING EQUIPMENT
(see fig. 97)

- | | |
|-------------|-------------------------|
| 1 — Rivet | 4 — Upper reinforcement |
| 2 — Leather | 5 — Bracelet |
| 3 — Pin | 6 — Lower reinforcement |



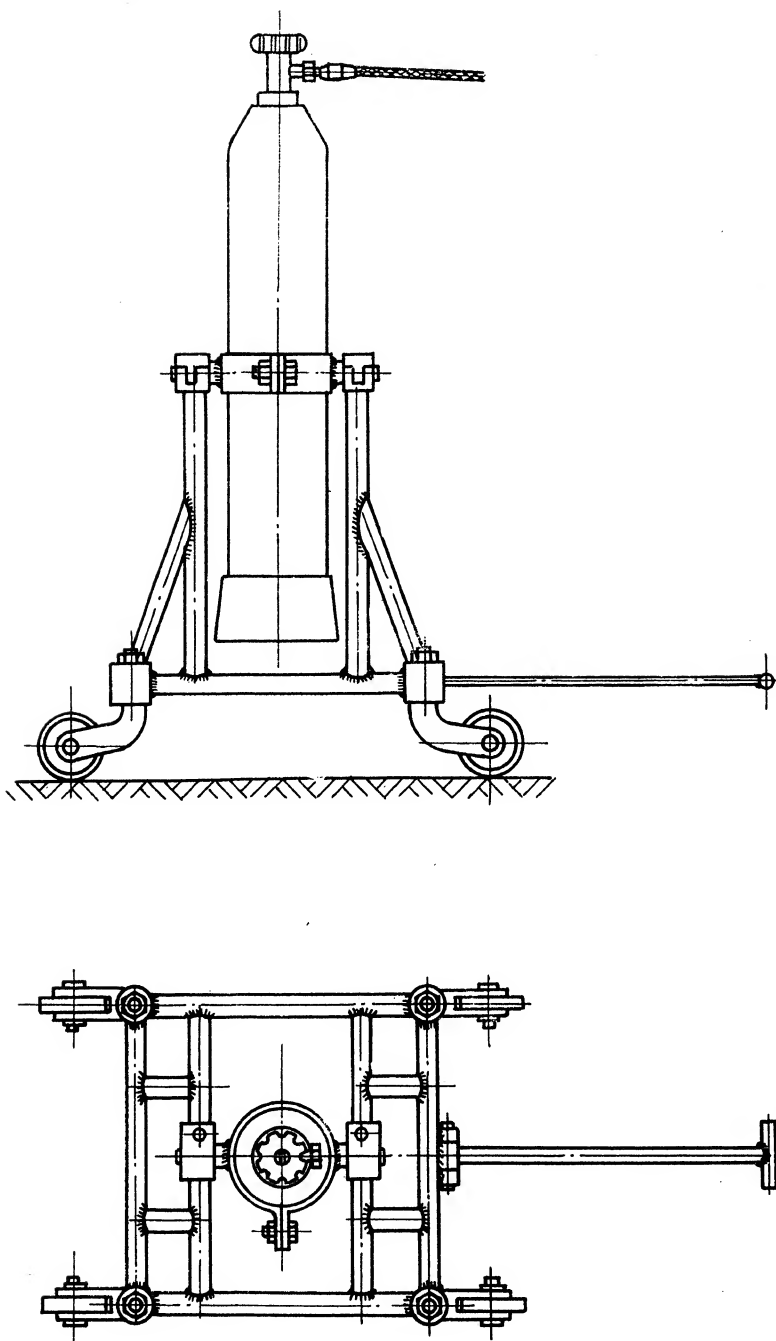


Fig. 99 — RECUPERATOR FILLING EQUIPMENT

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INTRODUCTION

1. This ~~technical~~ manual is printed to serve as instruction for operation, keeping and maintenance of the 76 mm mountain gun M-48 B-1, 76 mm M-48 B-1A2 and 76 mm B-48 B-1A1-I in troop units and establishments.

This technical manual replaces the previous edition of the instructions for "76 mm mountain gun M-48 B-1".

2. Disassembling, assembling and repairs which may be performed in troop units are included in this manual and should be performed under the supervision of a technical Officer or an artillery artizan. All persons performing the supervision must have complete knowledge of the weapon and of the belonging accessories.

3. In all cases when the required repair, replacement or adjustment is beyond the unit level, the responsible workshop should send the qualified personnel with adequate tools and equipment for the purpose of proper performance of repairs or to give the necessary instructions.

4. All disassembling and repairing not prescribed in this manual are included in the "Reconditioning" book for all modifications of the weapon.

The differences between models

The differences between individual models of this weapon are in the following :

1. The 76 mm mountain gun M-48 B-1

- The weapon is equipped with pneumatic tyres and with spring devices having spiral springs.

- The weapon is suitable for motor vehicle tow transportation with maximum speeds up to 60 km/h and on poor roads and off roads at speeds permitted for the motor vehicle and also for tandem tow and by loading on

pack-saddles. For all methods of transportation the necessary accessories are provided in spares, tools and accessories set of the weapon.

- The face of the breechblock is provided with a built-in backplate which is attached with screws.

- The hydraulic recoil brake and the recuperator are filled with compressed air and hydraulic fluid "STEOL MJ". The ring shaped rubber jointing of the floating piston in the middle cylinder is coated with leather.

Remark : As an improvement of this model the following changes have been made : instead of compressed air, the use of compressed azote has been introduced, instead of hydraulic fluid "Steol MJ", the use of hydraulic fluid "STEOL MM" has been introduced and the ring shaped rubber jointing of the floating piston is not being coated with leather. The weapons on which these improvements are not yet introduced, should be sent to the appropriate workshops for reconditioning.

2. The 76 mm mountain gun M-48 B-1A2

- The weapon is equipped with wheels made of light alloy with solid semi-elastic tyres and instead of spring devices with spiral spring ; this model is provided with a cylindrical coil spring.

- In consideration of the wheel design the weapon is adapted for transportation at a speed of 30 km/h on good roads and depending on the quality of the road it should be reduced as required.

- The weapon is suitable for transportation in tandem tow and on pack-saddles. For this purpose it is provided with necessary accessories in the weapon set of spares, tools and accessories.

- The breechblock face is not provided with a separate built-in backplate.

- The hydraulic recoil brake and the recuperator are being filled similarly to the model 76 mm M-48 B-1 and it is necessary to introduce all improvements indicated under "The

ed under "The 76 mm mountain gun M-48 B-1".

- This model is furnished with the weapon set of spares, tools and accessories which varies from the set for model B-1 owing to the differences in wheels and spring devices. The weapons may be furnished with the universal set of spares, tools and accessories which is adequate for both B-1 and B-1A2 models.

The design changes on this model are made for the purpose of :

- greater durability of the spring device,
- eliminating the sensitivity of pneumatic tyres on mechanical injuries during transportation and against bullets and artillery shell fragments,
- reducing the pack weight of the wheel with the spring device for 20 kg during mountain transport on pack-saddles,
- reducing the pressure on the thill animal in tandem tow for 10 kg.

3. The 76 mm mountain gun M-48 B-1A1-I

- The weapon is equipped with pneumatic wheels same as for model B-1, with the exception that the hub interior is same as on the wheel with the solid tyre B-1A2, making the removal of the wheel from the axle simple.

- The spring device with the cylindrical coil spring is the same as on model B-1A2 and in assembly with pneumatic tyres enables travelling speed of 60 km/h on good roads and off roads at the speed allowed for the towing motor vehicle.

- This model is not adapted for transportation on pack-saddles, because the weapon set of spares, tools and accessories is not furnished with the necessary accessories for loading on pack-saddles. All other necessary elements for pack-animal loading are attached on the weapon.

- The weapon is not suitable for tandem towing, because the lunette is not provided with a special

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seating for the thill fork. Only models B-1 and B-1A2 are provided with this seating.

- The hydraulic recoil brake and the recuperator are filled with azote and hydraulic fluid "STFOL MM" and all jointings are made of rubber without the leather coat on the ring shaped jointing of the floating piston.

- The sear on its upper surface is different from the sears of models B-1 and B-1A2.

- The breechblock face is not provided with a separate built-in backplate as on the model B-1.

P A R T O N E

GENERAL DATA ON THE SCOPE, DESIGN, AMMUNITION AND
TRANSPORT OF THE GUN

/Fig. 1a, 1b, 2, 3 and 4/

1 - SCOPE

The 76 mm mountain gun may be used for the following tasks :

- Destroying live no targets in the open or under light cover, as well as enemy emplacements,
- Destroying tanks and other motor vehicles,
- Counterbattering of the enemy artillery,
- Breaking wire obstacles and opening gaps in mine-fields,
- Demolition of light and heavy pillboxes.

2 - CHARACTERISTIC FEATURES OF THE GUN

This gun is rapid-firing, with a semiautomatic breechblock, comprising : a twin-trail carriage, worm springs, equilibrators, balancing parts, traversing and elevating mechanisms with arc segments. The gun is provided with a muzzle brake.

The recoil brake is hydraulic and the recuperator is hydropneumatic. The recuperator has a floating piston and the recoil brake is provided with a spring compensator. The recoil brake has a recoil-length regulator, whilst the recuperator has a recoil-speed regulator. The pressure in the recuperator amounts to 62 atm. The recoil brake contains 1,2 lit. of fluid /oil/, and the recuperator 1,24 lit. The recoil brake and the recuperator are provided with sufficient reserve fluid.

The wheels run on inflated tyres.

Ad 2. By models 76 mm M-48 B-1 and 76 mm M-48 B-1A1-I the wheels are made of steel with pneumatic tyres while by model 76 mm M-48 B-1A2 the wheels are made of light alloy with solid semi-elastic tyres.

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For pack transport the gun is disassembled into eight parts, each with an average weight of 96 kg. The 76 mm mountain gun M-48 B-1A1-I must comply to the following tactical technical data :

- Caliber	76.20 mm
- Diameter on grooves	77.724 mm
- Width of lands	3 mm
- Width of grooves	7 mm
- Depth of grooves	0.762 mm
- Length of the barrel	1178 mm
- Number of grooves	24
- Rifling twist angle	3°17' to 7°10'
- Rifling twist direction	to the right
- Capacity of the powder chamber	1.490 dm ³
- Forcing Cone	306 ⁺ 4 mm
- Length of the rifled portion of the barrel	779 mm
- Ballistic life of the barrel	12000 rds approx.
- Carriage System	twin-trail
- Horizontal field of action	50° ± 1°
- Vertical field of action	- 15° to + 45°
- One turn of the barrel elevation mechanism wheel	0 - 08 %
- One turn of the barrel traversing mechanism wheel	0 - 26 %
- Capacity of fluid in the hydraulic recoil brake	1200 kg
- Capacity of fluid in the recuperator	1240 kg
- Azote pressure in the recuperator	62 ± 1 Atm.
- Maximum recoil length	830 mm
- Recoil length at 45°	530 mm
- Maximum powder gas pressure	1880 kg/cm ²
- Pressure on motor vehicle hook	20 kg
- Air pressure in the tyre	1.5 Atm.
- Tyre size	6 x 16
- Track width	approx. 1300 mm
- Length of gun in firing position	3070 mm
- Length of gun in march position	2420 mm

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- Distance between spread trails	2.650 mm
- Fire line height	730 mm
- Shields height	1.220 mm
- Height of gun at max. elevation	1.670 mm
- Clearance	180 mm
- Maximum travelling speed :	
wheels with pneumatics	60 km/h
wheels with solid tyres	30 km/h
- Disassembling possibility for easy loading during great distance transports	8 assemblies
- Crew number	6 men
- Rate of fire	25 rds.
The weight data :	
- Gun in march position	720 kg
- Barrel	78 kg
- Breechring with semi-automatic breechblock	73 kg
- Barrel mantle with muzzle brake	71 kg
- Cradle with filled hydro-elastic system	94 kg
- Top carriage	108 kg
- Carriage trails with motor towing lunette	100 kg
- Shields	50 kg
- Wheels with pneumatic tyres and spring devices	110 kg

/See Section "Differences between models"/

3 - CHARACTERISTICS OF THE SIGHTING EQUIPMENT

The sighting equipment consists of range quadrant, a telescope and a gunner's quadrant. The scale of the range quadrant is divided in mils for the HF superquick action shell, and in meters both for the hollow-charge /HF,AT/ shell and the HF superquick action shell, when fired with the propelling charge No. 3.

The basic position of the instruments is : for the range-quadrant - zero both on the rough and on the fine scale; for the angle of site scale - 3-00; for the azimuth scale - 32-00; for the elevating scale - zero. The intervals increase in anti-clockwise direction.

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- Distance between spread trails	2.65o mm
- Fire line height	73o mm
- Shields height	1.22o mm
- Height of gun at max. elevation	1.67o mm
- Clearance	18o mm
- Maximum travelling speed :	
wheels with pneumatics	6o km/h
wheels with solid tyres	3o km/h
- Disassembling possibility for easy loading during great distance transports	8 assemblies
- Crew number	6 men
- Rate of fire	25 rds.
The weight data :	
- Gun in march position	72o kg
- Barrel	78 kg
- Breechring with semi-automatic breechblock	73 kg
- Barrel mantle with muzzle brake	71 kg
- Cradle with filled hydro-elastic system	94 kg
- Top carriage	1o8 kg
- Carriage trails with motor towing lunette	1oo kg
- Shields	5o kg
- Wheels with pneumatic tyres and spring devices	11o kg

/See Section "Differences between models"/

3 - CHARACTERISTICS OF THE SIGHTING EQUIPMENT

The sighting equipment consists of range quadrant, a telescope and a gunner's quadrant. The scale of the range quadrant is divided in mils for the HF superquick action shell, and in meters both for the hollow-charge /HF,AT/ shell and the HF superquick action shell, when fired with the propelling charge No. 3.

The basic position of the instruments is : for the range-quadrant - zero both on the rough and on the fine scale; for the angle of site scale - 3-oo; for the azimuth scale - 32-oo; for the elevating scale - zero. The intervals increase in anti-clockwise direction.

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4 - GENERAL DATA ON AMMUNITION

The gun uses a HF shell or a HF,AT shell. The round with HF shell has 4 increment propelling charges, the cartridge case being normally fitted with 3 charges; if desired to fire with the fourth charge, this charge must be taken out of a special package and put into the cartridge case and added to the 3 available charges.

The HF,AT shell is used with a special propelling charge as a fixed round. The propelling charge of the round with the HF,AT shell corresponds to the charge No.3 of the round with HF shell.

Firing at armoured vehicles with HF,AT shells is of advantage only up to 1000 meters.

Data on ammunition are given in the Firing Tables.

5 - GENERAL DATA OF TRANSPORTATION

For mountain transport the gun can be transported on pack animals or by tandem-towing. Otherwise the gun can be towed by motor-vehicles, and also it can be loaded on trucks. The gun model 76 mm M-48 B-1A1-I should be transported only by motor vehicles because the weapon set of spares, tools and accessories contains no accessories for pack loading and the lunette is not provided with the seating for the thill fork which is required for tandem towing.

The gun is loaded on 8 pack-animals:

- The top carriage with the axle
- The wheels spring devices
- The carriage trails
- The cradle
- The mantle
- The barrel
- The breech-ring, and
- The sighting devices, shields, spare parts and tools.

In tandem-towing the gun is drawn by two or three horses, as necessary.

Marching speed :

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- On pack animals or tandem towing 5 km/h
- Horse-towing 5-6 km/h
- Towed by motor-vehicles : on concrete or asphalt roads up to 60 km/h, off roads depending on the speed of the towing vehicle. By weapons 76 mm M-48 B-1A2 in view of the solid tyres the travelling speeds may be up to 30 km/h on good roads and depending on the road quality the speed should be reduced when necessary.

Packing takes 2,5 minutes and as long to unpack.

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P A R T T W O

MAIN PARTS OF THE GUN

The main parts of the 76 mm mountain gun are :
1 - The barrel with breechring assembly and semiautomatic breechblock, mantle and muzzle-brake;
2 - The carriage; and
3 - The sighting equipment.

Each gun is furnished with spare parts and tools. The weapon sets of spares, tools and accessories vary depending of the models. The weapons B-1 and B-1A2 may be furnished with universal sets which are suitable for both models.

I. THE BARREL, BREECHRING, SEMI-AUTOMATIC BREECHBLOCK, AND THE MANTLE WITH THE MUZZLE-BRAKE

A. THE BARREL

/Fig. 5a/

The barrel is of monobloc design without reinforcement and is manufactured of special alloyed steel.

On the rear part of the barrel there is an arc-shaped slot enabling the barrel to rotate freely in its bearing in the breechring without interference of the extractor's shaft. In addition to the arc-shaped slot there are two more parallel recesses for the extractor arms, and a square slot for the safety pin connecting the barrel with the breechring, located on the left side of the breechring, preventing the barrel from rotation in the breechring.

On the rear cylindrical part of the barrel there are interrupted threads connecting the barrel with the breechring there are corresponding slots for these interrupted threads.

Against the smooth parts between the interrupted threads, nearer the front part there are other interrupted threads of the same

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rupted threads of the same length, connecting the barrel with the mantle.

On the rear cylindrical part of the barrel there is a movable ring with its holder screwed into the barrel. Through this ring the bar is inserted, when disassembling and assembling the barrel. In addition to the above mentioned function, this ring, entering with its square projection in a slot on the mantle, prevents the barrel from rotating in the mantle the very moment the breechring is being separated from the barrel.

In order to prevent the ring from moving, after the barrel has been assembled, one half of the ring is thinner and this part is placed in a slot in the front part of the breechring.

Welded onto the conical part of the barrel is an arc-shaped adapter with a circular pad on its re-inforced part, fixing the barrel to the pack-saddle.

Welded onto the slightly conical part towards the front end of the barrel is a movable ring through which the bar is passed when disassembling and assembling the barrel.

On the cylindrical front part of the barrel there are two notches, guiding the barrel through the mantle in disassembling and assembling the gun. The smaller square notch moves across the correspondent slot in the upper, and the bigger one in the lower part of the mantle.

The ballistic life of the barrel is approx. 12000 rounds. The standard forcing cone is 306 ± 4 mm. Method of gauging, see in section for barrel inspection during firing.

B. THE BREECHRING

/Fig. 5b. and 5c./

The breechring is square-shaped, its front part being cylindrical and slightly conical.

On the rear part there is a shackle for putting a bar through it when disassembling and assembling the

15

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On the rear cylindrical part of the barrel there
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B. THE BREECHRING

/Fig. 5b. and 5c./

The breechring is square-shaped, its front part
ing cylindrical and slightly conical.

On the rear part there is a shackle for putting
bar through it when disassembling and assembling the

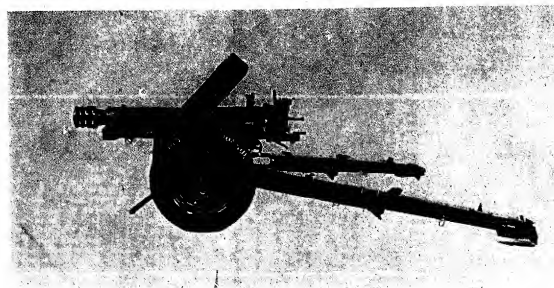


Fig. 1a — 76 mm MOUNTAIN GUN M 48 B-1 and B-1A 1-1

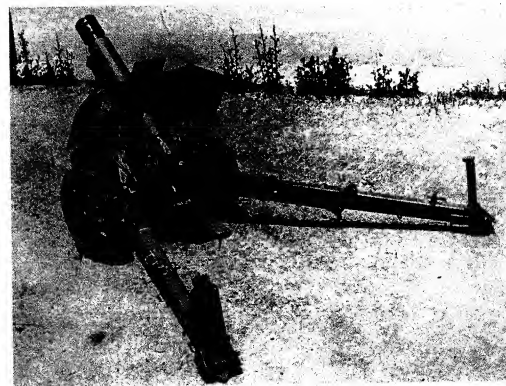


Fig. 1b — 76 mm MOUNTAIN GUN M 48 B-1A2

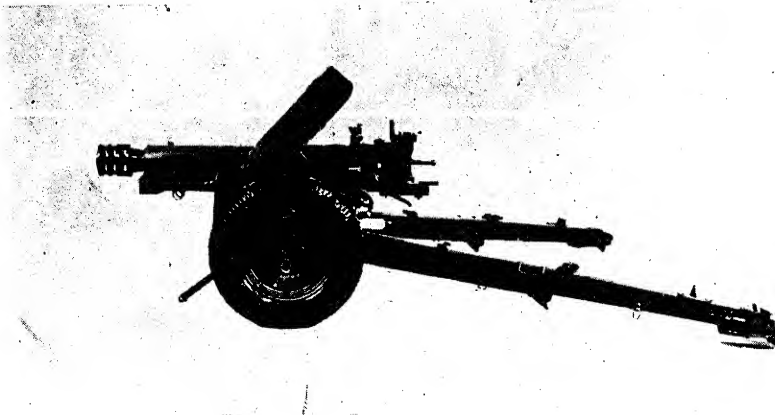


Fig. 1a — 76 mm MOUNTAIN GUN M 48 B-1 and B-1A 1-I

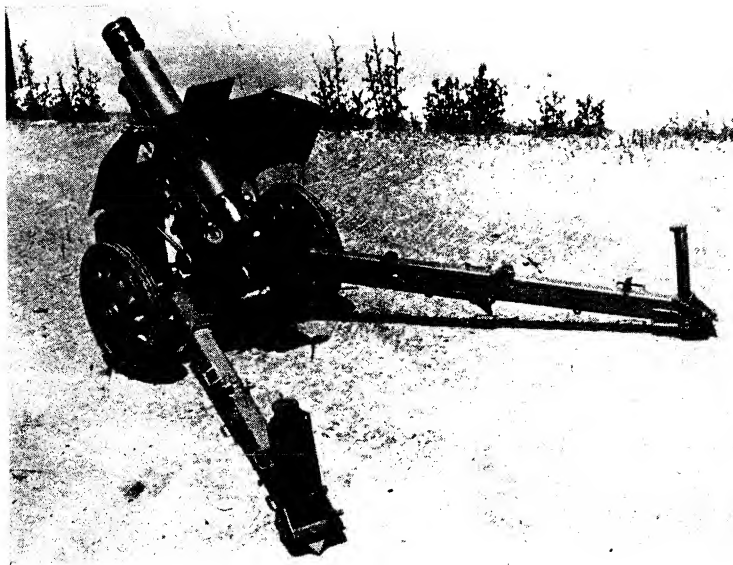


Fig. 1b — 76 mm MOUNTAIN GUN M 48 B-1A2

rupted threads of the same length, connecting the barrel with the mantle.

On the rear cylindrical part of the barrel there is a movable ring with its holder screwed into the barrel. Through this ring the bar is inserted, when disassembling and assembling the barrel. In addition to the above mentioned function, this ring, entering with its square projection in a slot on the mantle, prevents the barrel from rotating in the mantle the very moment the breechring is being separated from the barrel.

In order to prevent the ring from moving, after the barrel has been assembled, one half of the ring is thinner and this part is placed in a slot in the front part of the breechring.

Welded onto the conical part of the barrel is an arc-shaped adapter with a circular pad on its re-inforced part, fixing the barrel to the pack-saddle.

Welded onto the slightly conical part towards the front end of the barrel is a movable ring through which the bar is passed when disassembling and assembling the barrel.

On the cylindrical front part of the barrel there are two notches, guiding the barrel through the mantle in disassembling and assembling the gun. The smaller square notch moves across the correspondent slot in the upper, and the bigger one in the lower part of the mantle.

The ballistic life of the barrel is approx. 12000 rounds. The standard forcing cone is 306 ± 4 mm. Method of gauging, see in section for barrel inspection during firing.

B. THE BREECHRING

/Fig. 5b. and 5c./

The breechring is square-shaped, its front part being cylindrical and slightly conical.

On the rear part there is a shackle for putting a bar through it when disassembling and assembling the

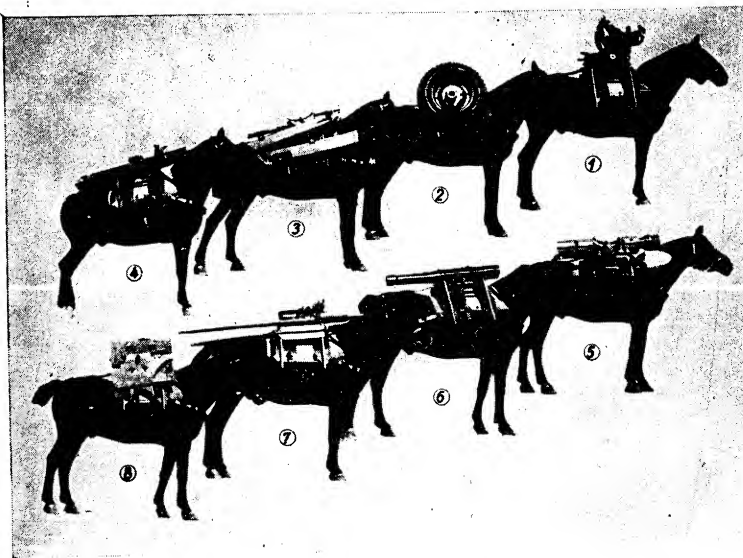


Fig. 2 — 76-mm MOUNTAIN GUN M 48 B-1 LOADED ON PACK ANIMALS —

- 1 — Carriage
- 2 — Wheels
- 3 — Trails, towing fork and lunette
- 4 — Cradle
- 5 — Mantle and frames with equipment
- 6 — Barrel and cradle support
- 7 — Breechblock, spades, thill
- 8 — Shields, sighting equipment and accessories spare parts

Fig. 3 — 76 mm MOUNTAIN GUN M 48 B-1 — Tandem towing (without forward horse)

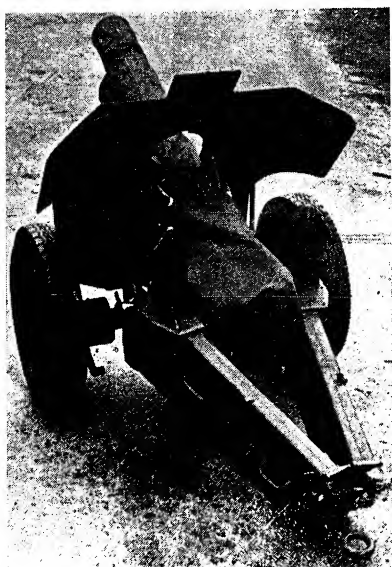
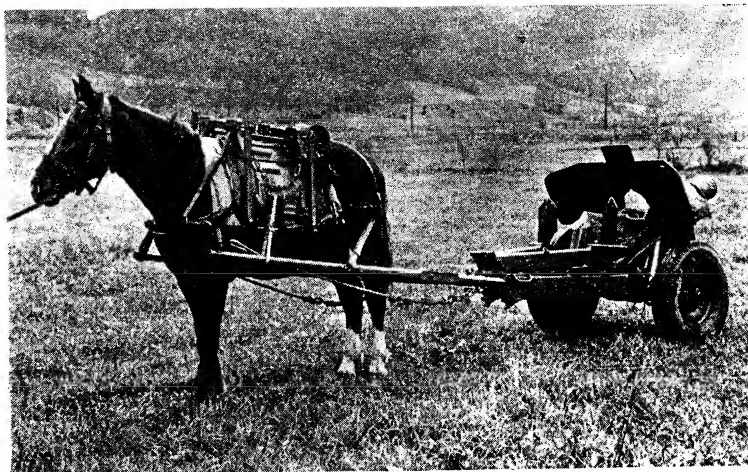


Fig. 4 — 76 mm MOUNTAIN GUN M 48 B-1 — Prepared for towing by motor trailer

gun and for putting a hook into it in order to perform artificial recoil. Located on the left or the rear lower part is the bearing of the handle shaft of the barrel connector for connecting the barrel with the hydraulic recoil-brake and the recuperator.

Located in the square part of the breechring is the breech-recess. On the right side of the square part near the top there is a round opening for the safety pin of the extractor-shaft.

Located on the upper surface of the square-shaped part are the following features :

- In the right rear corner a slot for the bearing of the operating handle shaft, parts of the semiautomatic mechanism retainer; around the opening for the passage of the shaft operating the parts there is a round slot for a felt gasket, preventing dust from entering into the parts of the breechblock;

- In the center there is an opening for the breechblock re-cocking handle shaft and in front of it there is a round bearing for the breechblock re-cocking handle plug;

- On the right-hand side there is a recess for the operating lever brake tooth.

Engraved on the breechring is the serial number of the gun and the model. Which indicates the model, for example 76 mm mountain gun M-48 B-1A1-I /see section "Differences between models"/.

C. THE BREECHBLOCK AND THE SEMIAUTOMATIC MECHANISM

/ Fig. 6 - 19 /

The semiautomatic function of the breechblock is accomplished by the semiautomatic mechanism, whose action is based upon exploiting the movement of the barrel when returning the barrel in battery.

The firing is done by means of a trigger and can be done from both sides of the breechring. At stationary targets the gun is fired by the assistant gunner, by

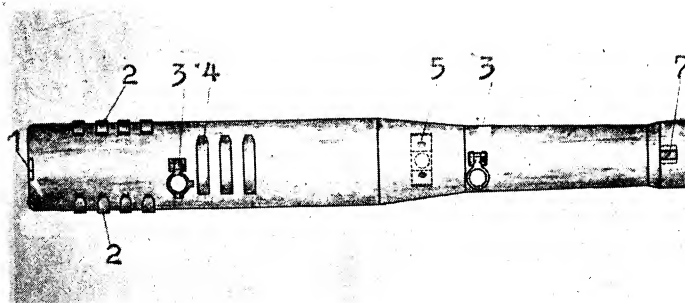


Fig. 5a — BARREL

- | | |
|---|------------------------|
| 1 — Interrupted treads for attaching the breechring | 4 — Interrupted treads |
| 2 — Interrupted treads | 5 — Adapter |
| 3 — Eye | 7 — Mantle guide |

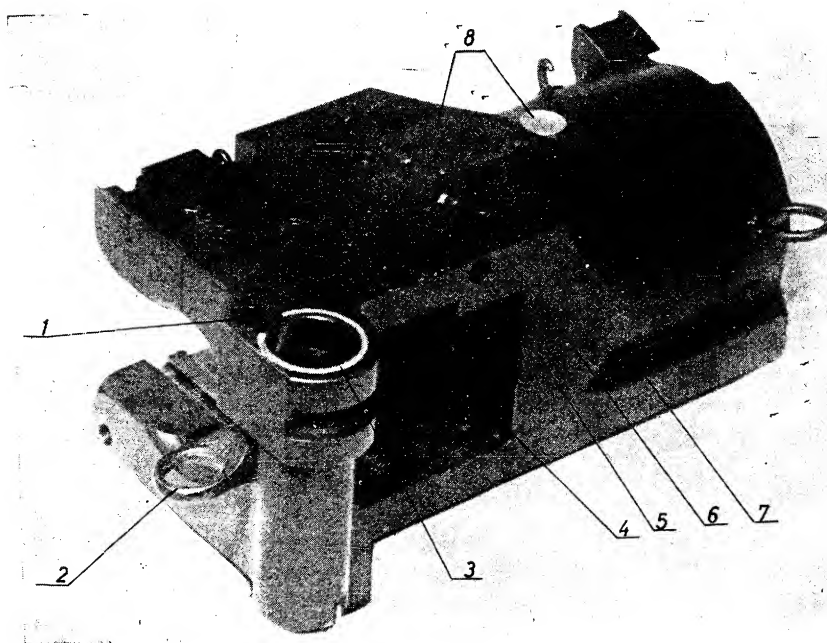


Fig. 5b — BREECHRING — View

- | | |
|---------------------------------|--------------------------------------|
| 1 — Semiautomatic retainer seat | 5 — Extractor shaft retainer opening |
| 2 — Artificial recoil lug | 6 — Extractor shaft seat |
| 3 — Semiautomatic shaft bore | 7 — Slider lubricator |
| 4 — Recocking handle seat | 8 — Quadrant plane |

Notice: Fig. 5c — rear Fig. 41

means of an auxiliary trigger or with the lanyard on the right side of the breechring. When firing at moving targets, the gunner activates the trigger shaft on the left side of the breechring.

The breech-block consists of the following parts /Fig. 6/ :

- The body
- The operating parts
- The firing lock
- The triggering parts
- The extracting parts
- Lock and safety parts, and
- Auxiliary parts.

1 - The breechblock body

/Fig. 6, 8a, 8b, 9a and 9b/

The breechblock body is wedge shaped.

On the breechblock front the seating for the front plate is located. On models B-1A2 and B-1A1-I the breechblock is not provided with the backplate; the breechblock face forms a whole with the breechblock body.

The rear end of the breechblock body is flat and perpendicular on the bore of the barrel. In the center there is a round cavity for placing the firing lock. Above the cavity there is a triangular mark with the engraved word "umetnuti" /meaning : "put in"/ and on the left side of the cavity there is only a triangular mark. These marks help in fitting the back plate.

2 - Operating parts

/Fig. 6, 7 and 10/

The operating parts of the breechblock are designed for manual and semiautomatic operations, and consist of the following parts :

- The operating lever with the circular box
- The guide
- The operating parts shaft, and
- The semiautomatic mechanism.

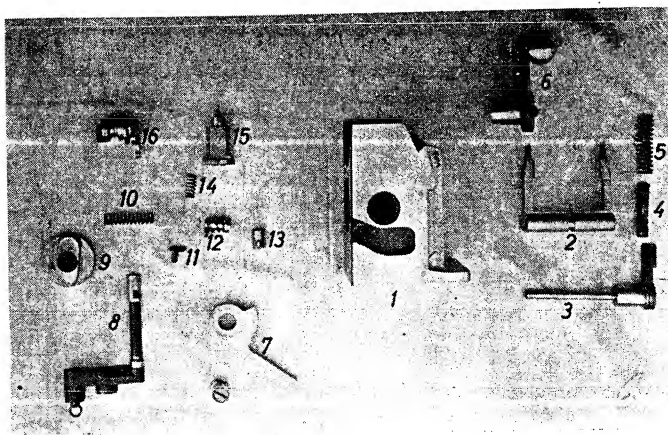


Fig. 6 — BREECHBLOCK PARTS

- | | |
|-------------------------------|------------------------------|
| 1 — Body | 9 — Back plate |
| 2 — Extractors | 10 — Firing pin spring |
| 3 — Extractor shaft | 11 — Pintle |
| 4 — Pusher | 12 — Trigger with spring |
| 5 — Extractor spring | 13 — Semiautomatic lock |
| 6 — Recocking handle assembly | 14 — Spring |
| 7 — Guide | 15 — Firing pin with striker |
| 8 — Trigger shaft | 16 — Sear |

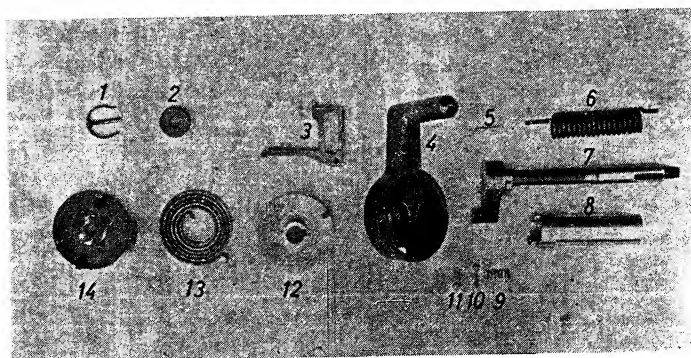


Fig. 7 — SEMIAUTOMATIC MECHANISM PARTS

- | | |
|-------------------------|----------------------|
| 1 — Safety pin | 8 — Bushing |
| 2 — Nut | 9 — Spring |
| 3 — Lever | 10 — Pin |
| 4 — Circular box | 11 — Bushing |
| 5 — Key | 12 — Inner connector |
| 6 — Closing spring | 13 — Opening spring |
| 7 — Semiautomatic shaft | 14 — Cover |

The operating lever with the circular box /Fig. 7 and 10/ serves for opening and closing the breechblock manually and for opening the breechblock for the first round.

It consists of :

- The handle with the lock
- The lower arm with the box, and
- The connecting pin with the guide.

The guide is made in form of a triple arm lever.

The semiautomatic mechanism is designed for semiautomatic operation of the breechblock. For its action it exploits the returning of the barrel in battery. The semiautomatic parts are fitted in the circular box on the operating lever, in the right-hand rear corner on the breechring and on the operating lever fixed on the right side of the cradle. The semiautomatic mechanism consists of :
/Fig. 7 and 10/

- The circular box with cover
- The spring for opening
- The inner connector
- The spring for closing
- The spring case
- The retainer of the semiautomatic mechanism and
- The slider with the latch.

The circular box is made from one part with the operating lever and houses the breechblock spring for opening the inner connector. On the bottom side the circular box is cut-out in an arc for one-third of its perimeter to provide a passage for the tooth on the lower end of the inner-connector and of the retaining tooth of the semiautomatic mechanism. Inside the box there is a hole for the outer end of the spring for opening. A slot on the upper side limits the straining of the spring.

The circular box cover has on its lower side two arc-shaped notches for entering the cut-outs in the inner connector and on the upper side there are two indented teeth for removal and replacement.

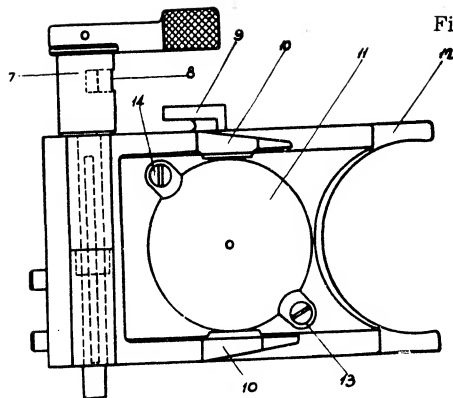


Fig. 8a — BREECHBLOCK ASSEMBLY
(WITH THE FRONT PLATE)

- 7 — Extractor shaft
- 8 — Extractor shaft retainer seating
- 9 — Sear
- 10 — Extractor
- 11 — Front plate
- 12 — Breechblock body
- 13 — Front plate fastener
- 14 — Front plate fastening screw

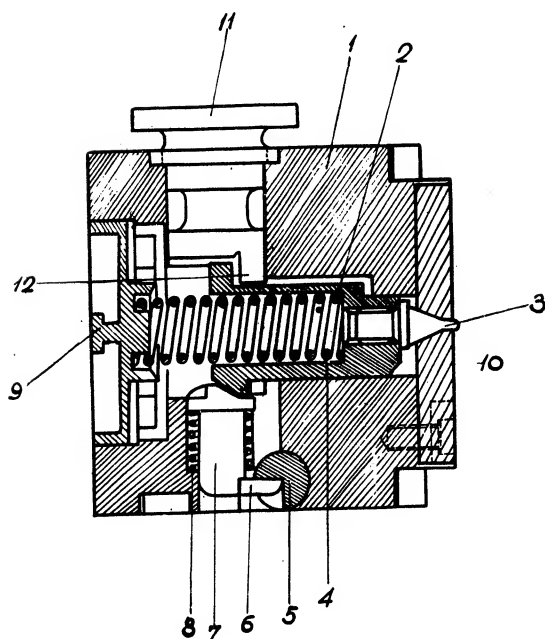


Fig. 8b — BREECHBLOCK —
SECTION

- 1 — Body
- 2 — Striker
- 3 — Firing pin
- 4 — Striker spring
- 5 — Trigger shaft
- 6 — Trigger dent
- 7 — Trigger
- 8 — Trigger spring
- 9 — Back plate
- 10 — Front plate
- 11 — Sear
- 12 — Sear dent

On the rim of the cover there is an arc-shaped notch, one end of which keeps the spring strained in the circular box, and the other is designed to get under the operating lever in semiautomatic operation of the breechblock, to lift the lock-tooth out of its seat, and thus to enable the opening of the breechblock as a result of the action of the semiautomatic spring, located in the circular box. The circular box cover is fixed on the operating parts shaft with a nut, the nut being secured by a cotter pin.

The spiral spring for opening is fixed at one end to the circular box and at the other one to the inner connector. The semiautomatic opening of the breechblock strains the part of the spring which is fixed to the inner connector, whereas in order to open the breechblock, the outer end of the spring, which is fixed in the circular box, is expanding.

The inner connector has the shape of a round cut-through plate, having in its center a roller shaped projection, connecting the spring for opening with the operating parts shaft. The inner connector is being fixed to the operating parts shaft by a pin.

The spiral spring for closing is located in the case of the semiautomatic mechanism. Through it passes the operating parts shaft. One end of the spring is fixed to the operating parts shaft and this part of the spring is being spanned during the opening of the breechblock. The other end is fixed to the upper part of the case and it expands during the closing of the breechblock.

The case of the semiautomatic mechanism serves for straightening and protecting the closing spring. In its upper part there is an opening with four holes for adjusting the strength of the semiautomatic mechanism spring. On its lower part there is a dent fitting in a cut-out indenture on the operating parts lever shaft and a square notch for fixing the case in the breechring, during the

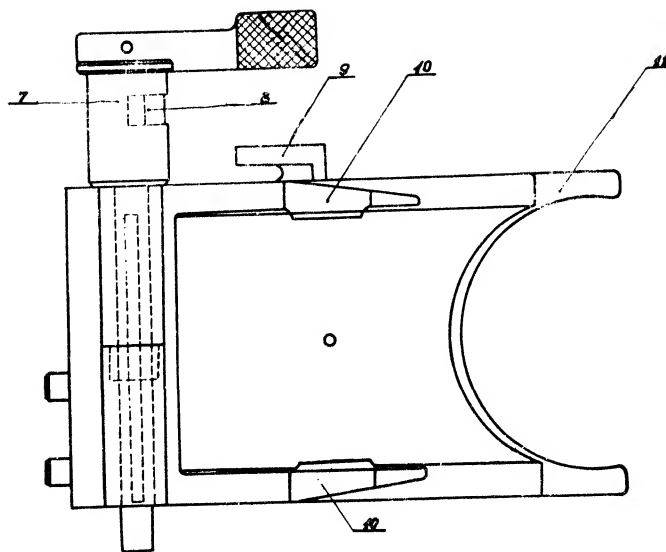


Fig. 9a — BREECHBLOCK ASSEMBLY (WITHOUT THE FRONT PLATE)

- | | |
|--------------------------------------|-----------------------|
| 7 — Extractor shaft | 10 — Extractor |
| 8 — Extractor shaft retainer seating | 11 — Breechblock body |
| 9 — Sear | |

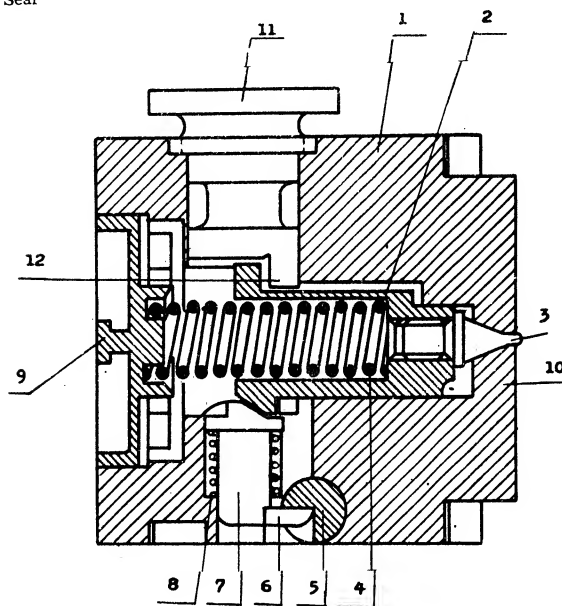


Fig. 9b — BREECHBLOCK ASSEMBLY SECTION (WITHOUT THE FRONT PLATE)

- | | |
|--------------------|-----------------------|
| 1 — Body | 7 — Trigger |
| 2 — Striker | 8 — Trigger spring |
| 3 — Firing pin | 9 — Back plate |
| 4 — Striker spring | 10 — Breechblock face |
| 5 — Trigger shaft | 11 — Sear |
| 6 — Trigger dent | 12 — Sear dent |

ing the turn of the operating parts shaft.

The semiautomatic mechanism retainer has the function of preventing the inner connector from turning, until the notch on the cover of the circular box gets under the lock, so lifting the dent of the operating lever handle lock.

The retainer of the semiautomatic mechanism consists of the following parts :

- the retainer with two dents, and
- the spring.

The bigger dent on the retainer serves to hold the inner connector of the semiautomatic mechanism. Sliding over the smaller dent the circular box presses the whole retainer into its recess, thus unlocking the inner connector and opening the breechblock under the action of the spring.

The slider with the latch are integral parts of the semiautomatic mechanism and that of the parts designed for opening the breechblock. It is located on the copying device which connects the circular box with the cradle. The slider is an integral part of the operating cam, and the rocker arm is rocking around its shaft and is provided with a spring pushing it permanently to the right. The latch is fixed to the operating cam by means of a ring, a washer and a cotter pin.

3 - The firing lock

/Fig. 8b and 9b/

The firing lock is designed to fire the round after the loading and the closing of the barrel has been completed.

The firing lock consists of :

- the firing pin
- the striker
- the striker spring
- the back-plate.

By model B-1A1-I the upper surface of the sear varies in shape from the models B-1 and B-1A2. The sear

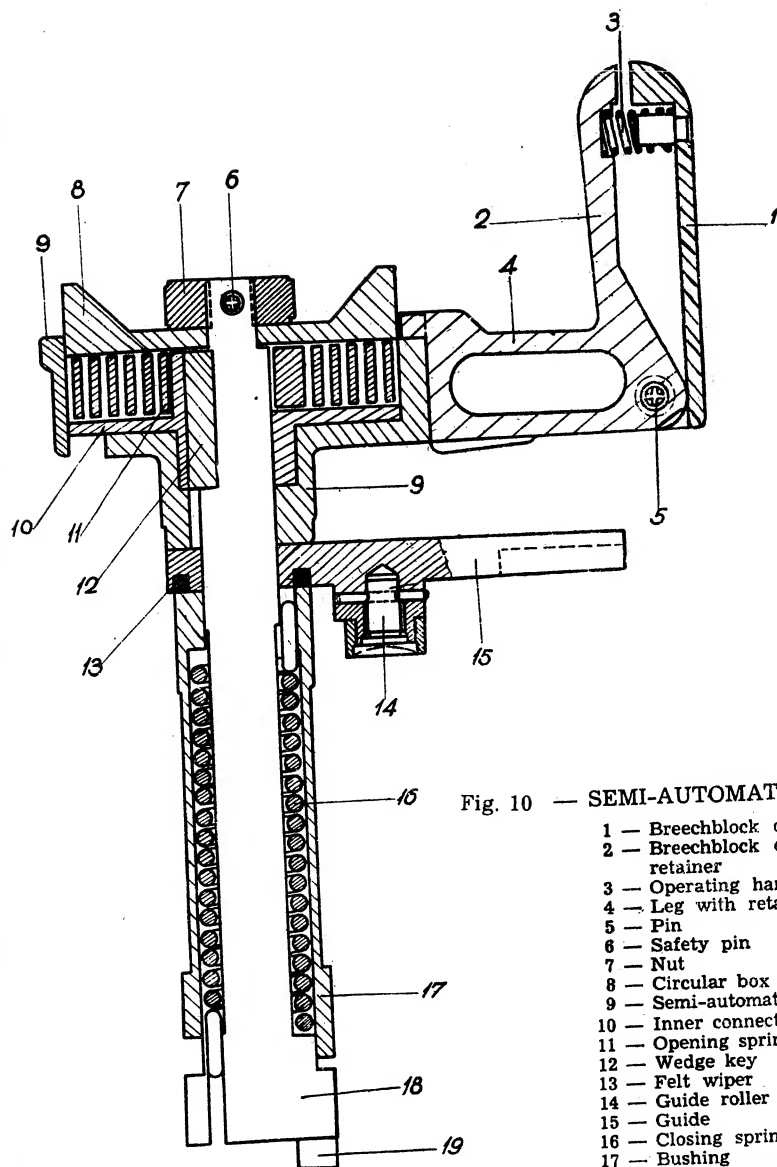


Fig. 10 — SEMI-AUTOMATIC ASSEMBLY

- 1 — Breechblock operating handle
- 2 — Breechblock operating handle retainer
- 3 — Operating handle retainer spring
- 4 — Leg with retainer dent
- 5 — Pin
- 6 — Safety pin
- 7 — Nut
- 8 — Circular box cover
- 9 — Semi-automatic mechanism box
- 10 — Inner connector
- 11 — Opening spring
- 12 — Wedge key
- 13 — Felt wiper
- 14 — Guide roller
- 15 — Guide
- 16 — Closing spring
- 17 — Bushing
- 18 — Semi-automatic shaft
- 19 — Semi-automatic shaft dent

of the B-1A1-I may be used also for weapons B-1 and B-1A2 with prior adaptation by the artillery artizan.

4 - The triggering parts

/Fig. 11, 13, 14, 16, 17, 18a, 18b and 19/

These parts serve for triggering. They consists of :

- the trigger
- the auxiliary trigger, and
- the detent with the spring.

The auxiliary trigger /Fig.19/ is operated by the assistant gunner in engaging stationary targets. It is located in a box on the body of the operating cam fixed on the right side of the cradle. It consists of :

- a handle
- a shaft
- a lever
- a lever spring
- a pusher
- a pusher spring, and
- an auxiliary trigger box.

The auxiliary trigger should not be disassembled for training purposes, such action being permitted only for the purpose of repair and replacement of parts.

The gun is fired by the trigger.

The trigger /Fig.11/ consists of :

- the shaft
- the lever with the roller and the lock, and
- the sear with the spring.

The trigger shaft is prismatically cut out to fit in the notch of the sear. Fixed in the middle of the lever is the roller with the purpose of minimizing friction when firing is done with the auxiliary trigger.

Located at the end of the lever is the trigger lock. The lock consists of a bolt with a spring and a stop. On the bolt head there is a dent which enters its seat on the lock case when the trigger is unlocked. The head of the locking bolt

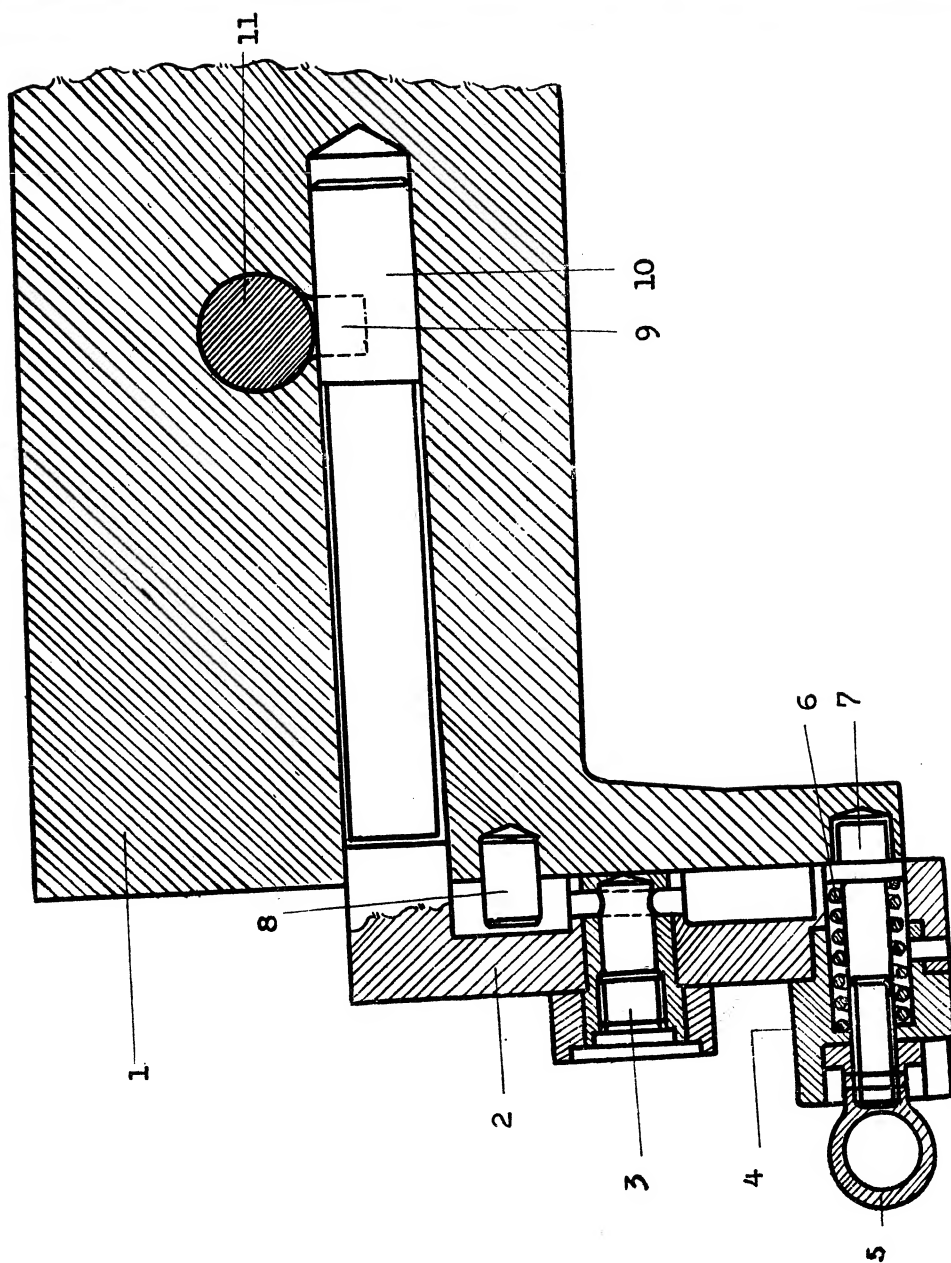


Fig. 11 — TRIGGER ASSEMBLY

- | | |
|----------------------|--------------------|
| 1 — Breechblock body | 7 — Lock pin |
| 2 — Trigger lever | 8 — Trigger stop |
| 3 — Roller | 9 — Trigger dent |
| 4 — Bushing | 10 — Trigger shaft |
| 5 — Eyebolt | 11 — Trigger |
| 6 — Spring | |

head of the locking bolt ends with a fixed ring for putting on the trigger hook, and for pulling back the bolt, while locking and unlocking the trigger.

5 - The extracting parts

/Fig. 8a, 9a and 15/

The extracting parts extract the empty cartridge cases and maintain the breechblock in the open position by not permitting the spring of the semiautomatic mechanism to close the breechlock until separation from the breechblock body.

They consist of :

- two double-arm extractors
- the extractor shaft with its handle, and
- the extractor shaft lock.

6 - The locking and safety parts

The parts for locking of the breechblock are described together with the individual assemblies. The parts of the breechblock prevent firing before the breechblock is completely closed.

7 - The auxiliary parts of the breechblock

The auxiliary parts of the breechblock serve in activating the various parts of the breechblock.

The auxiliary parts are :

- the recocking handle, and
- the lanyard.

The recocking handle /Fig.12/ is designed for recocking the firing lock in case that a round would not fire, without necessitating the opening of the breechblock.

It consists of :

- the handle with the lock
- the lever, and
- the handle shaft.

8 - The operating cam /Fig.19/

The operating cam regulates, when recoiling, by means of the slider, the moving of the operating parts

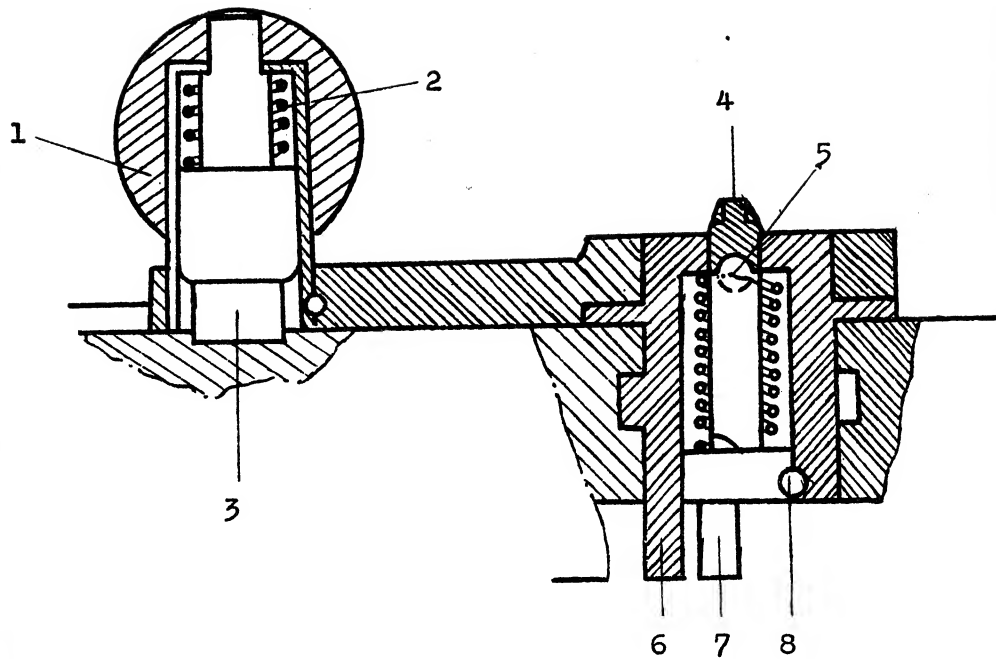


Fig. 12 — RECOCKING HANDLE ASSEMBLY

- | | |
|--------------------|----------------------|
| 1 — Handgrip | 5 — Pin |
| 2 — Spring | 6 — Mechanism casing |
| 3 — Handgrip shaft | 7 — Recocking dent |
| 4 — Rear sight | 8 — Pin |

shaft, thus straining the spring of the semiautomatic mechanism. On the operating cam there are the slider with the latch, forming part of the semiautomatic mechanism, and the auxiliary trigger, the latter being an integral part of the firing parts of the breechblock.

The operating cam is fixed to the cradle. When removing the operating cam it is necessary :

- to separate the breechring from the cradle,
- to pull back the barrel with the breechring and the mantle for 20 cm,
- to remove the operating cam by pulling it backwards.

9 - Semiautomatic action of the breechblock

During the recoil of the gun the operating parts shaft lug by-passes the slider and the latch on the right, and pushing the latch to the left, slides over the latter.

The parts of the breechblock are, during recoil, at rest.

During the return-in battery, the operating parts shaft reaching the latch, strikes it with the lug, the latch together with the slider resists, pushing the lever backwards. The lug of the lever slides over the left side of the latch and the slider, since striking the latch and slider the lever turns together with the operating parts shaft. By the turning of the shaft, the opening and closing springs are strained.

The opening spring is fixed to one of its ends at the circular box and the other end to the inner connector, which, being connected with the shaft, straining the opening spring. When the inner connector turns, the circular box cover turns together with it. The inner connector catches with its lug the retainer of the semiautomatic mechanism, preventing the mechanism from turning until the lug on the circular box cover passes under the safety lock, thus lifting the elbow lever handle locking lug. After the elbow lever handle has been released the

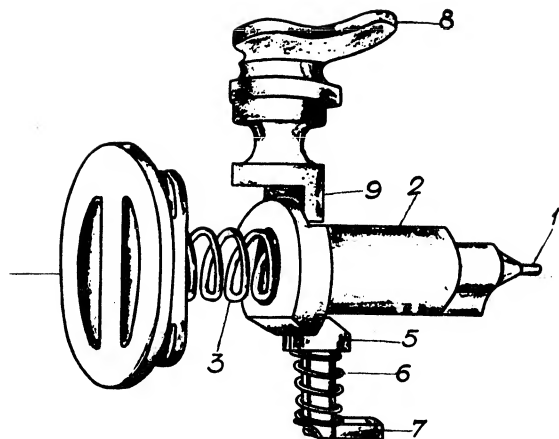


Fig. 13 — TRIGGERING PARTS

- 1 — Firing pin
- 2 — Striker
- 3 — Firing pin spring
- 4 — Back plate
- 5 — Trigger head
- 6 — Trigger spring
- 7 — Trigger lug
- 8 — Sear
- 9 — Sear lug

Fig. 14 — TRIGGER

- 1 — Striker
- 2 — Trigger head
- 3 — Trigger lug
- 4 — Trigger shaft
- 5 — Roller
- 6 — Trigger handle

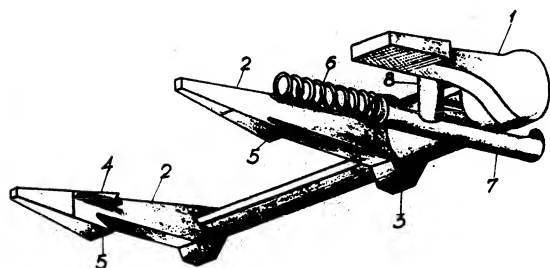
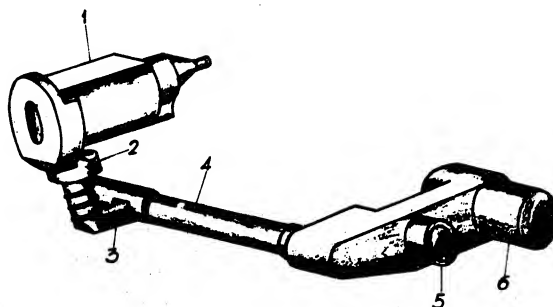


Fig. 15 — EXTRACTING PARTS

- 1 — Extractor shaft
- 2 — Twin arm extractor
- 3 — Breechblock striking latch
- 4 — Click for cartridge case rim
- 5 — Pawl connecting the breechblock
- 6 — Lock spring
- 7 — Locking bolt
- 8 — Extractor shaft locking stop

opening spring expands and, its end being fixed to the circular box, turns the box thus opening the breechblock. By its turning motion the circular box pushes the retainer with its lug, releasing the inner connector. The very moment the breechblock opens the extractor arms catch the breechblock and keep it in its open position.

Simultaneously with the straining of the opening spring the closing spring also strains; its function is the same as in manual opening.

If the extractor arms disengage the breechblock, the closing spring turns the operating parts shaft. Together with the shaft moves also the operating lever, transmitting its motion to the breechblock, thereby closing the barrel.

D. FIRING

a/ The gun is always fired by hand; firing can be done from the left or from the right side of the breechring. Firing from the left side is performed by the gunner at moving targets, and with a reduced number of crew, while firing in all other cases is carried through by the assistant gunner.

When engaging moving targets, the gunner tracks the targets operating with his left hand the elevation hand wheel, and with his right hand the azimuth hand wheel. He fires by operating with the right hand the trigger handle. The gunner's trigger, through the assistant gunner's triggershaft, lifts the pusher which, by pushing the roller, lifts the trigger lever, whose shaft turns in its bearing and catching the trigger lug with the notch, pulls it downward. As a result of being pulled downwards the head compresses the spring, and the lug releases the striker rim, which is driven forward under the action of the spring, the firing being performed by the firing pin striking the primer.

b/ Firing with the assistant gunner's auxiliary trigger

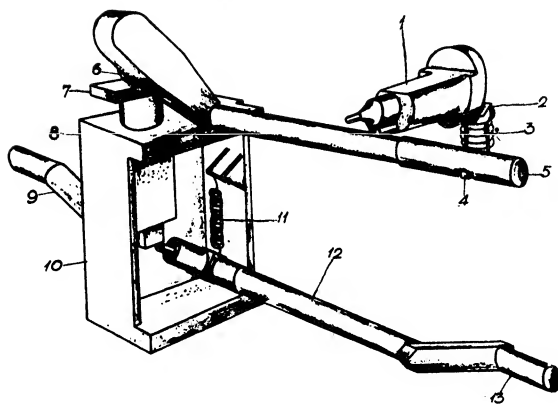


Fig. 16 — TRIGGERING PARTS

- | | |
|-------------------|----------------------------------|
| 1 — Striker | 8 — Auxiliary trigger case |
| 2 — Trigger head | 9 — Auxiliary trigger handle |
| 3 — Spring | 10 — Auxiliary trigger lever lug |
| 4 — Trigger lug | 11 — Lever spring |
| 5 — Trigger shaft | 12 — Triggering shaft |
| 6 — Roller | 13 — Triggering handle |
| 7 — Pusher | |

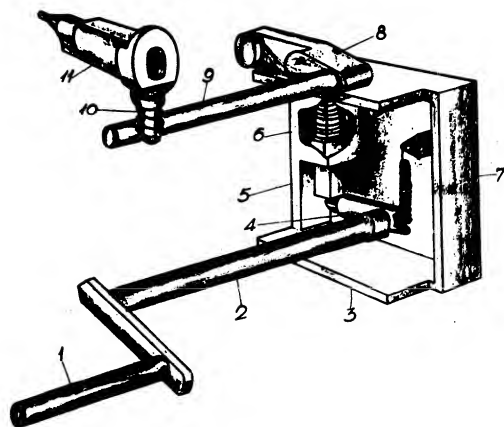


Fig. 17 — FIRING PARTS

- | | |
|------------------------------|-------------------|
| 1 — Auxiliary trigger handle | 7 — Casing |
| 2 — Auxiliary trigger shaft | 8 — Trigger lever |
| 3 — Casing base | 9 — Trigger shaft |
| 4 — Pusher | 10 — Trigger |
| 5 — Plug | 11 — Striker |
| 6 — Spring | |

Firing by means of the auxiliary trigger is performed by the assistant gunner in engaging stationary targets. Such firing can be done manually or by means of the lanyard.

Manual firing is effected by the assistant gunner who grasps with his right hand the auxiliary trigger handle pulling it upwards and to the rear. The motion of the handle is transmitted through the auxiliary trigger shaft and lever to the pusher, which through the roller lifts the trigger lever, and accomplishing firing, as exposed under a/.

The firing accomplished, and the assistant gunner having swiftly released the handle, the auxiliary trigger, under reaction of the spring returns to its seat, and the pusher leans against the auxiliary trigger box. During this action the auxiliary trigger lever under the action of its spring /in the box/ returns with its longer arm into lower position, and re-catches the pusher, permitting further firing.

Firing with the auxiliary trigger by means of the lanyard is effected by attaching the latter to the trigger handle eye, after which the lanyard is abruptly pulled and released.

c/ Firing with the assistant gunner's trigger

If the auxiliary trigger is unserviceable, firing can be done by means of the ass. gunner's trigger. This way of firing may also be done manually or by means of the lanyard.

Manual firing is performed by the assistant gunner, who grasps with his right hand the trigger lock casing and pulls the lever upwards and to the rear. By this pull on the trigger lever the trigger shaft is turned in its bearing, the shaft pulling with its notch the trigger lug and releasing the striker.

F. RE-COCKING THE BRECHBLOCK MECHANISM

In case the round would fail to fire, it is ne-

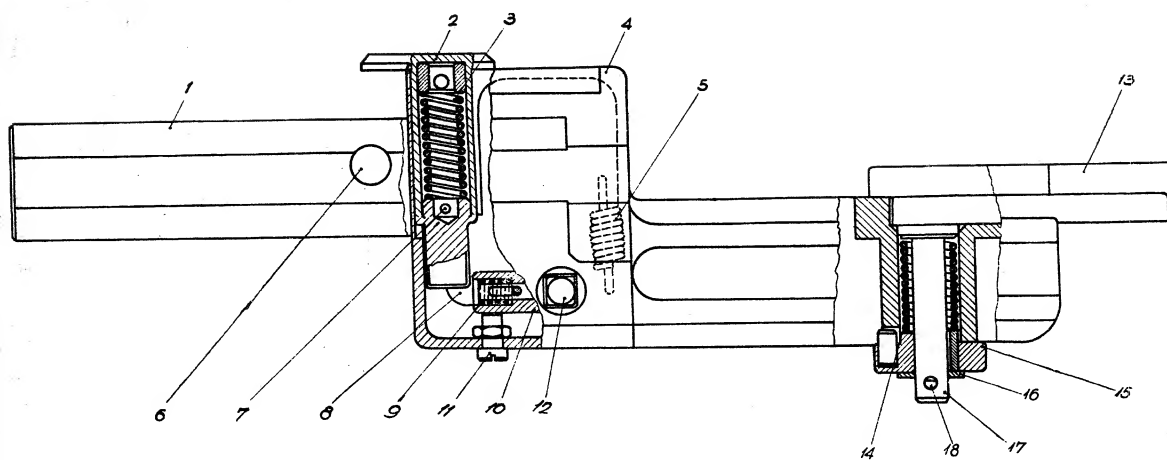


Fig. 18a — OPERATING CAM ASSEMBLY

- | | |
|------------------------------------|------------------------------------|
| 1 — Operating cam body | 10 — Pusher lever |
| 2 — Trigger lifter | 11 — Stop screw |
| 3 — Trigger lifter spring | 12 — Seat, auxiliary trigger shaft |
| 4 — Cam casing cover | 13 — Cam |
| 5 — Auxiliary trigger lever spring | 14 — Cam return spring |
| 6 — Cam fastener | 15 — Nut |
| 7 — Pin | 16 — Washer |
| 8 — Trigger lifter pusher dent | 17 — Cam shaft |
| 9 — Lever spring, lifter pusher | 18 — Pin |

cessary to recock the breechblock mechanism. This is done by means of the recocking handle without opening the breechblock.

To carry out recocking it is necessary to unlock the handle pulling it with the right hand upwards in order to get the locking plug out of its seat in the breechring. After unlocking, the handle is pulled to the left and rear in result of which the lug of the shaft will press the sear and turn it into its seat. By the turning motion of the sear the striker is pulled back, the striker spring is compressed and once the striker rim has passed over the trigger lug, the breechblock is again recocked. When the handle returns to its original position, the latch contacts the sear lug, allowing the handle to return.

F. DISASSEMBLING OF THE BREECHBLOCK AND SEMIAUTOMATIC MECHANISM

Disassembling and assembling of the breechblock may be done for purposes of cleaning, replacement of unserviceable parts and for training purposes.

Disassembling of the operating lever and of the parts of the semiautomatic mechanism in the circular box, and in the semiautomatic spring casing is not permitted for every-day maintenance.

The mentioned parts are disassembled for training purposes, for repair or replacement.

Disassembling is performed by means of the wrench from the battery set of spares, tools and accessories, as follows :

- a - When performed by the gun crew
- 1 - Pull the trigger and remove the lanyard if the latter was on the breechblock
- 2 - Remove the breechblock
- 3 - Remove the back-plate
- 4 - Remove the striker spring
- 5 - Remove the striker, using the recocking handle; if it

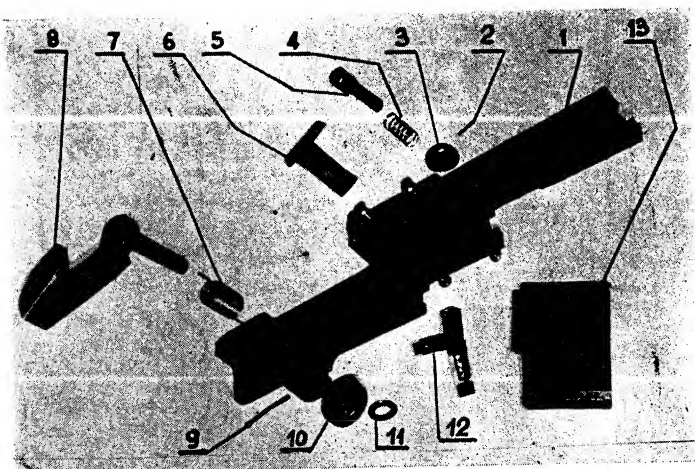


Fig. 13b — OPERATING CAM WITH CRANK

- | | |
|------------------------------|-------------------------|
| 1 — Operating cam body | 8 — Cam crank |
| 2 — Pin | 9 — Pin |
| 3 — Washer | 10 — Nut |
| 4 — Spring | 11 — Washer |
| 5 — Shaft | 12 — Trigger shaft hole |
| 6 — Auxiliary trigger pusher | 13 — Casing |
| 7 — Spring | |

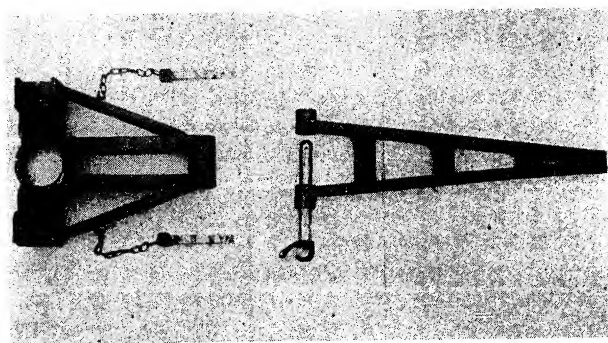


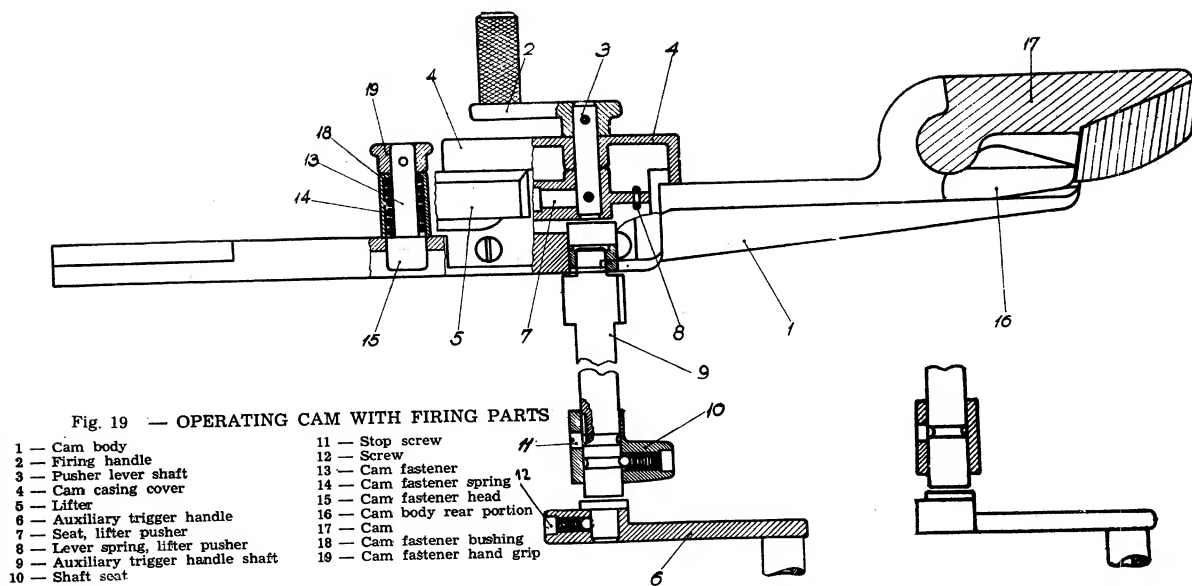
Fig. 35 — CRADLE SUPPORT FOR TRAVELING

is desirable to remove the firing pin, then it should be unscrewed counter-clock-wise; remove the breechring connector, pull the barrel backwards so far that the breechblock shaft lever will not pass the latch on the operating cam.

- 6 - Remove the operating parts shaft cotter pin
- 7 - Unscrew anti-clockwise the operating parts shaft nut
- 8 - Lift up the circular box with the opening spring
- 9 - Take out the pin for fixing the operating parts shaft
- 10 - Pull out the operating parts shaft
- 11 - Press the locking bolt down and lift the extractor bolt out
- 12 - Remove the extractor shaft locking pin, by pressing the locking bolt and removing the stop and the spring
- 13 - Push the breechblock body outwards for one-half of its length with the left hand, at the same time holding it with the right hand
- 14 - Separate the guide from the breechblock
- 15 - Remove the twin-arm extractors
- 16 - Remove the sear
- 17 - Place the breechblock so, that the trigger lug may get out of its seat, press the trigger lug through the sear opening, take out the trigger shaft and remove the trigger lug together with the spring
- 18 - Remove the recocking handle by pulling the handle up, unlocking the handle, turning it to the left and rear to its extreme position and lifting the lever upwards
- 19 - Remove the retainer of the semiautomatic mechanism together with the spring.

b - When performed by the artillery mechanics

- 1 - To remove the opening spring it is necessary to place the operating lever with the circular box and the opening spring into their seat on the breechring, and to embrace the two lugs on the cover with a wrench from the battery set of spares, tools and accessories; turn the cover to the left till the cover lug separat-



es from the box, lifting the cover only so much that it separates from the circular box, and slowly release the opening spring with the wrench, lift the cover when the spring releases. Remove the opening spring and the inner connector.

- 2 - To remove the closing spring it is necessary to bring the spring casing of the semiautomatic mechanism into a vise, to turn the shaft to the left in order to separate the casing lug from the shaft lug, to pull out the shaft, and take out the spring of the casing.
- 3 - To remove the operating lock remove the cotter pin from the shaft, and then remove the shaft, the lock and the lock spring.
- 4 - To remove the barrel lock pin from the breechring, drive out the pin on the lower side of the shaft, lift the shaft, remove the safety pin and remove the spring.

G. ASSEMBLING OF THE BREECHBLOCK AND SEMIAUTOMATIC MECHANISM

Assembling of the parts of the breechblock and the semiautomatic mechanism is done in reversed order.

Prior to assembling it is obligatory to wipe all the parts with a clean rag and to apply a thin layer of gun grease.

- a - When performed by the gun crew
- 1 - Install the barrel lock pin in the breechring, and secure the shaft with the pin
- 2 - Install the semiautomatic mechanism retainer together with its spring into their seat in the breechring.
- 3 - Install the recocking handle
- 4 - Take the breechblock, push the trigger lug into its seat, and insert the trigger shaft into the breechblock
- 5 - Install the sear
- 6 - Push the breechblock for one half of its length into the breech recess in the breechring

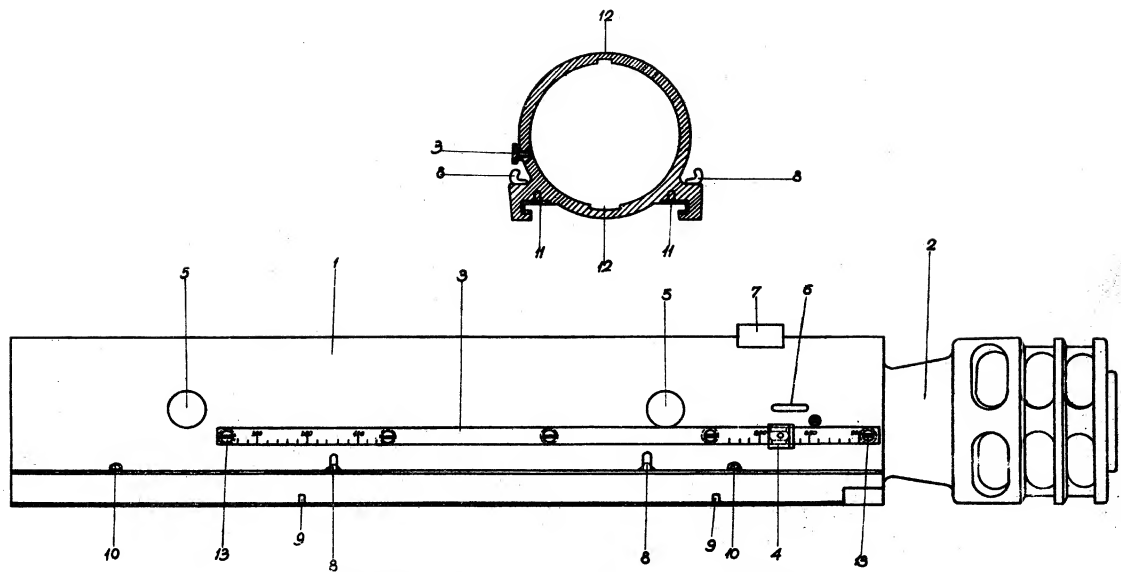


Fig. 20 — MANTLE WITH THE MUZZLE BRAKE — ASSEMBLY

- | | |
|-------------------------|--|
| 1 — Mantle | 8 — Packing hook |
| 2 — Muzzle brake | 9 — Pack saddle seating |
| 3 — Recoil length scale | 10 — Grease cups |
| 4 — Recoil length index | 11 — Slides brass screws |
| 5 — Holes on the mantle | 12 — Barrel guide grooves |
| 6 — Recess | 13 — Recoil length scale fixing screws |
| 7 — Front sight | |

- 7 - Install the operating parts guide
 - 8 - Install the twin arm extractors and the extractor shaft
 - 9 - Install the operating parts shaft with the inner connector fixing pin
 - 10- Close completely the breechblock
 - 11- Install the operating lever with the circular box
 - 12- Screw on the nut on the operating parts shaft and secure it with the cotter pin
 - 13- Install the striker, lift the trigger to release the firing lock, and install the striker spring
 - 14- Put the back plate in its position, and
 - 15- Check the functioning of the breechblock parts by opening and closing the breechblock, by recocking and pulling the trigger.
- When performed by the artillery mechanics
Assembling of the operating lever handle
- 1 - Install the operating lever handle safety lock spring, the safety lock, the shaft, and the cotter pin
 - 2 - In order to assemble the operating lever with the circular box it is necessary to install the inner connector with the opening spring in the circular box on the breechring, to strain the spring by turning the inner connector to the left till the lug on the inner side of the inner connector reaches the indenture in the circular box
 - 3 - Put the cover onto the box, and turn it with a wrench till the arc-shaped lug of the cover contacts the notch in the circular box, and then lower the cover by tapping slightly
 - 4 - To assemble the parts of the semiautomatic mechanism into the casing it is necessary to install the closing spring on the shaft, install the casing and strain the spring by turning the casing till its lug has leaned on the lug of the operating parts shaft
 - 5 - To install the barrel lock in the breechring, install

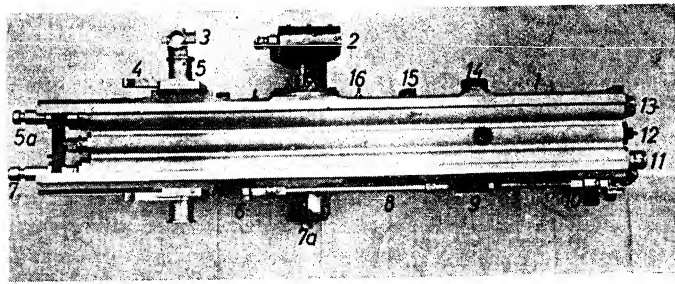


Fig. 21 — CRADLE ASSEMBLY

- | | |
|---|-----------------------------------|
| 1 — Cradle body | 8 — Recoil length regulator lever |
| 2 — Elevating gear case | 9 — Recoil length adjusting nut |
| 3 — Sight bracket | 10 — Adjusting index |
| 4 — Equilibrator cable hook | 11 — Counter-recoil rod |
| 5 — Cradle trunnion | 12 — Recoil brake filling valve |
| 5a — Recuperator piston rod extension | 13 — Recuperator cylinder cover |
| 6 — Recoil speed regulator with recuperator filling valve | 14 — Azote valve |
| 7 — Piston rod | 15 — Pack pad |
| 7a — Elevating pinion | 16 — Attaching hook |

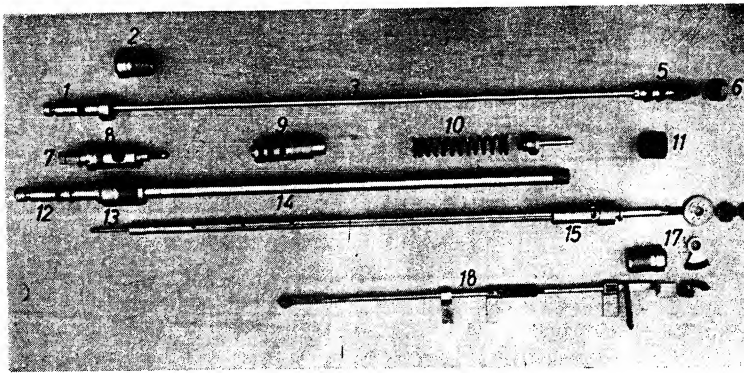


Fig. 26 — RECOIL MECHANISM PARTS

- | | |
|-------------------------------------|--|
| 1 — Piston rod extension | 10 — Compensator assembly |
| 2 — Stuffing box | 11 — Stuffing box with fluid filling valve |
| 3 — Piston rod | 12 — Piston rod extension |
| 4 — Azote filling | 13 — Stuffing box |
| 5 — Piston | 14 — Piston rod |
| 6 — Cylinder cover | 15 — Piston |
| 7 — Recoil speed regulator index | 16 — Buffer |
| 8 — Recoil speed regulator assembly | 17 — Counterrecoil rod |
| 9 — Floating piston | 18 — Recoil length regulator assembly |

the lock spring and then put the lock on the earlets, connect with the shaft and secure the shaft with a pin.

H. THE BARREL LOCK PIN ON THE BREECHRING

The barrel lock pin on the breechring secures the barrel preventing it from rotating around its longer axis, and protects the barrel from dirt. It is composed of the lock pin, the shaft and the spring.

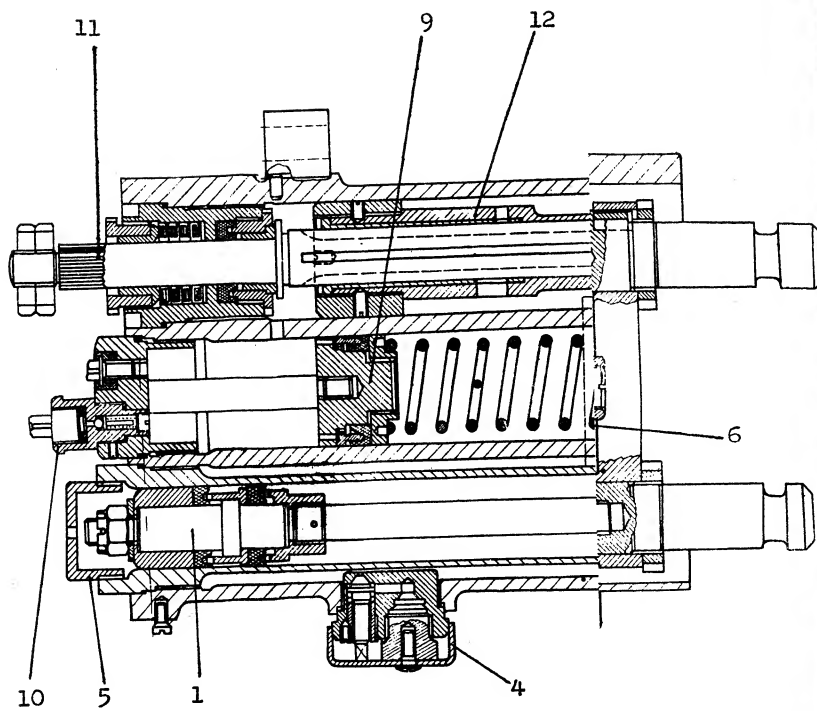
I. THE BARREL AND CRADLE LINK

This device is designed to link the barrel with the cradle by means of the piston rod extension of the hydraulic recoil and the recuperator. It is located in its seat in the breechring notch, the latter being provided with two circular boxes for the passage of the piston rod extension of the recuperator and the recoil-mechanism.

It consists of :

- the handle with its lock
- the shaft
- the gear wheel, and
- the connecting rod.

Connecting the barrel with the cradle. When installing the breechring in assembling the gun it is necessary to unlock the linking device by pulling the handle down and to the left. Through the pulling of the handle the motion is transmitted over its shaft and the gear to the connecting lever which is horizontally moving to the left so that the wider part of its opening match the bores on the breechring, thus permitting the piston rod extension to pass through them. After the breechring has been completely put on the barrel and the cradle, this fact being indicated by the stops - /small copper plates on the inner side of the breechring-lug/ the piston rod extensions have passed by this time through the bores of the lug and the connecting lever, and the grooves in the piston rod are in



rod are in line with the connecting lever. By closing the handle, the connecting lever is shifted to the right and clenches with its narrower bores the grooves on the piston rod extensions from the left side, thus securely connecting the cradle to the breechring.

Disassembling of the cradle from the barrel is done in reversed order.

J. THE MANTLE WITH THE MUZZLE BRAKE

/Fig. 2o/

1 - THE MANTLE

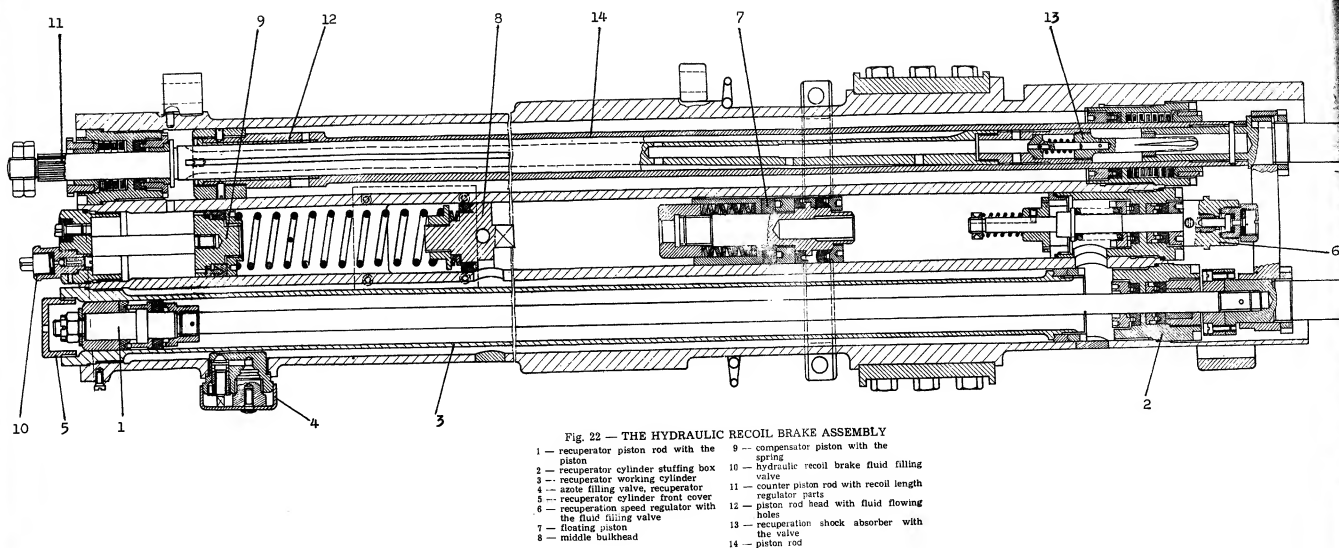
The mantle is made of steel, cylindrical in shape, and is designed to increase the weight of the recoiling masses of the gun, and to guide the barrel along the cradle during recoil.

On the sides of the mantle there are two pairs of circular openings for inseting bars for disassembling, and two longitudinal openings which are needed during the fabrication of the mantle. In addition, the circular openings are designed also for cooling the barrel, by means of the air circulating through them during firing. Attached to the right side of the mantle is a metallic rule with a millimeter scale showing the length of recoil from 300 to 850. The scale is divided from 10 to 10 millimeters. Attached to the rule is a movable index indicating the recoil length, its motion being limited by two index stops.

Prior to removing the mantle, the recoil-length index stop should be turned to the right and forward.

2 - THE MUZZLE BRAKE

The muzzle brake is made of alloyed steel, and belongs to the active type; it is cylindrically shaped, its function being to decrease the length of the recoil and to increase the effect of the powder gases /and with it increases the range/. On its front part there are 12 elliptical side holes to permit the gases to exhaust, after the shell has left the barrel.



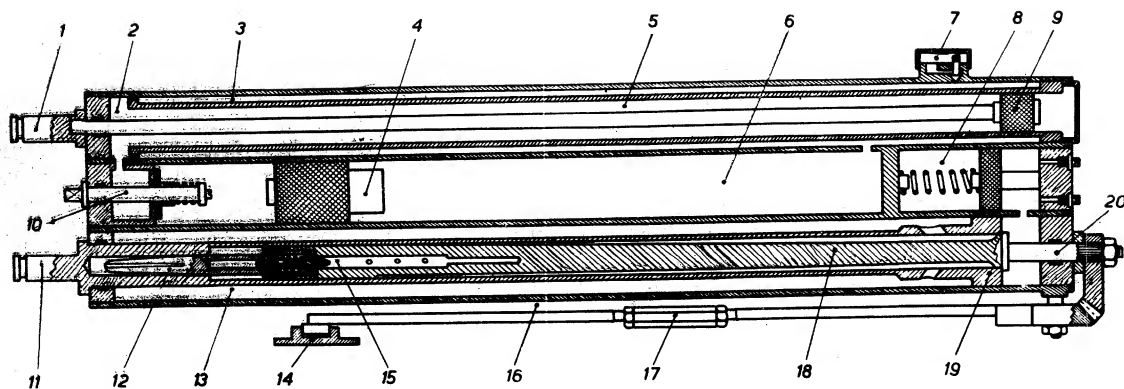


Fig. 23 — FUNCTIONING OF THE RECOIL BRAKE AND THE RECUPERATOR

- | | |
|----------------------------------|---------------------------------------|
| 1. Recupérateur piston rod | 11. Hydraulic recoil brake piston rod |
| 2. Fluid in the recuperator | 12. Shock absorber |
| 3. Recupérateur inner cylinder | 13. Recoil brake fluid |
| 4. Floating piston | 14. Recoil length regulator cam |
| 5. Fluid | 15. Fluid valve |
| 6. Compressed azote | 16. Hydraulic brake cylinder |
| 7. Azote valve assembly | 17. Recoil length adjusting screw |
| 8. Compensator | 18. Recoil brake piston rod |
| 9. Recupérateur piston | 19. Recoil brake piston |
| 10. Recuperating speed reg valve | 20. Counter piston rod |

The characteristics: The recoil brake is hydraulic with grooves on the counter piston rod of varying depth and length, it is fitted with a spring loaded compensator, recuperation brake valve, shock absorber and recoil length regulator. The recuperator

rod are in line with the connecting lever. By closing the handle, the connecting lever is shifted to the right and clenches with its narrower bores the grooves on the piston rod extensions from the left side, thus securely connecting the cradle to the breechring.

Disassembling of the cradle from the barrel is done in reversed order.

J. THE MANTLE WITH THE MUZZLE BRAKE

/Fig. 2o/

1 - THE MANTLE

The mantle is made of steel, cylindrical in shape, and is designed to increase the weight of the recoiling masses of the gun, and to guide the barrel along the cradle during recoil.

On the sides of the mantle there are two pairs of circular openings for inseting bars for disassembling, and two longitudinal openings which are needed during the fabrication of the mantle. In addition, the circular openings are designed also for cooling the barrel, by means of the air circulating through them during firing. Attached to the right side of the mantle is a metallic rule with a millimeter scale showing the length of recoil from 300 to 850. The scale is divided from 10 to 10 millimeters. Attached to the rule is a movable index indicating the recoil length, its motion being limited by two index stops.

Prior to removing the mantle, the recoil-length index stop should be turned to the right and forward.

2 - THE MUZZLE BRAKE

The muzzle brake is made of alloyed steel, and belongs to the active type; it is cylindrically shaped, its function being to decrease the length of the recoil and to increase the effect of the powder gases /and with it increases the range/. On its front part there are 12 elliptical side holes to permit the gases to exhaust, after the shell has left the barrel.

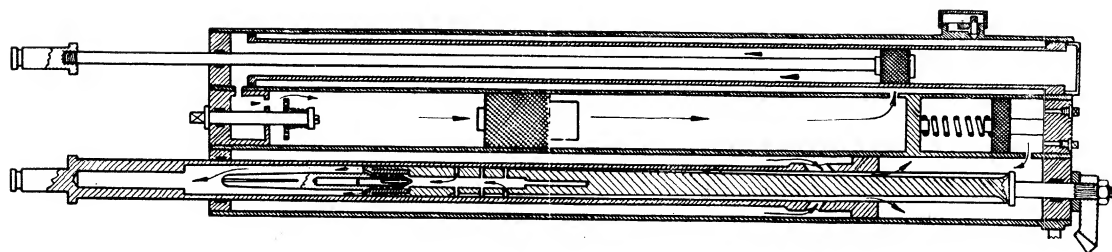


Fig. 24 — OPERATION DURING RECOIL

Operation of the recoil brake: The fluid passes through the piston to the other side of the cylinder through the valve, into the piston rod and into the compensator. Depending of the recoil length regulator elevation, turns the piston rod and reduces the fluid passage openings.

Operation of the recuator: The piston pushes the fluid which passes freely through the recuator speed regulator, pushes the floating piston which in turn compresses the azote in the recuator.

On the muzzle brake there is a mark to match a corresponding mark on the mantle for adjusting the muzzle brake. In the rear opening of the muzzle brake, enters the front portion of the barrel muzzle and in this manner the centering of the barrel is performed.

Disassembling and assembling of the muzzle brake should be done by artillery mechanics only.

Remark : Firing of the weapon without the muzzle brake is prohibited.

II. THE CARRIAGE

/Fig. 21a/

The carriage of the gun is divided into the top carriage and the bottom carriage. To the top carriage belong all those parts, which move in elevating and traversing the barrel, forming the movable part of the carriage. To the bottom carriage belong all those parts which remain immovable during elevating and traversing of the barrel, and during firing.

The parts of the top and bottom carriages are protected by shields.

The top carriage consists of :

- the cradle with the hydraulic recoil cylinder, the recuperator and the recoil-length regulator
- the top carriage body with the traversing and elevating gears, and
- the equilibrators.

A. THE CRADLE

/Fig. 21b/

The cradle is made of steel in one piece and is designed to house the hydraulic recoil mechanism and to permit the mantle with the barrel and the breechring to slide over it during recoil and counter-recoil.

Near to the front end of the cradle is an opening provided for screwing in the recuperator azote filler valve case.

Welded on three places along the right side are the brackets for the

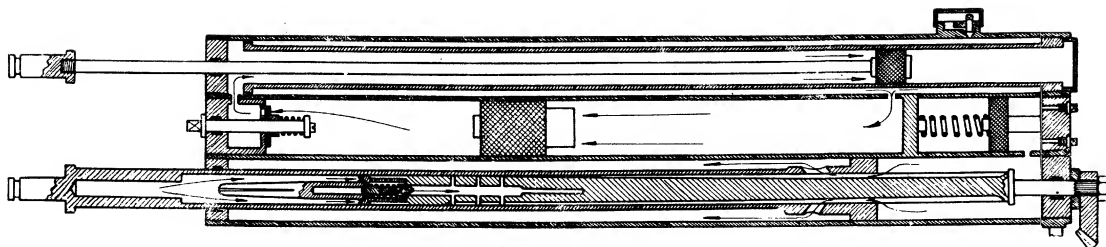


Fig. 25 — OPERATION DURING RECUPERATION

Operation of the recuperator: The compressed azote is pressing the floating piston which in turn pushes the fluid which closes the recuperating speed regulator valve and passes through small holes, and forces the recuperator piston head.

Operation of the recoil brake: The fluid from the piston rod is closing the holes in the recuperation brake valve and passes through the small holes on the valve then through the grooves on the counter piston rod and back through the piston head. The fluid from the compensator supplements the recoil brake cylinder. The last impact is soothed by the shock absorber.

the brackets for the recoil-length adjusting rod.

Attached to the front re-inforcement is the shaft with the gear pinion, and the toothed rack of the recoil-length rod.

Engraved on the front bracket of the adjusting bar is a scale in millimeters indicating the position of the recoil-length adjusting bar in relation to the counter-recoil piston rod. This scale serves for checking the recoil length.

Next to the front end of the cradle there is a square hole in the middle cylinder near the bulkhead designed for installing the bulkhead during manufacturing. On the hole is a cover fixed with four screws. This hole also serves for checking the reserve fluid in the recoil-cylinder /in the compensator/.

The inside of the cradle has three longitudinal bores forming the hydraulic recoil cylinders and the recuperator.

The right cylinder houses the parts of the hydraulic recoil brake.

The left cylinder houses the parts of the recuperator; screwed into it is the inner recuperating cylinder.

At two-thirds of its length from the breechring, the middle cylinder has a bulkhead. Its longer part beyond the bulkhead $\frac{2}{3}$ of the length/ houses the recuperating parts. By the breechring this cylinder has an opening for connection with the inner recuperating cylinder, and at the bulkhead there is also an opening, connecting the outer recuperator cylinder.

On the part of the middle cylinder located in front of the bulkhead there is an opening, connecting the right cylinder; it serves for housing the hydraulic brake parts.

The front side of the cradle is being closed with a protecting casing.

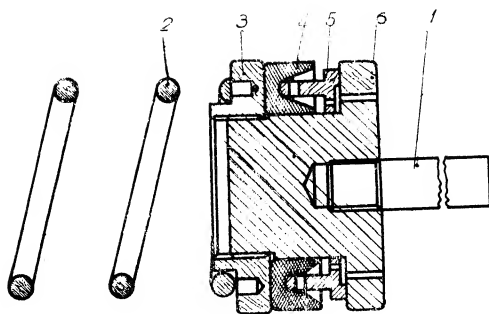
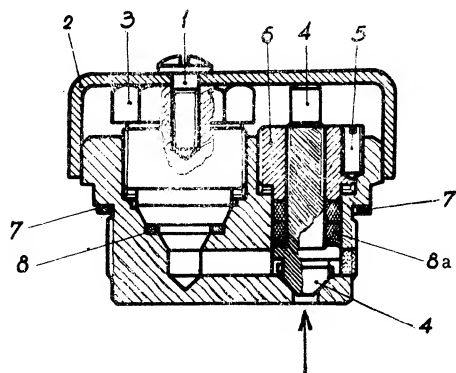


Fig. 27 — COMPENSATOR PISTON —

ASSEMBLY

- 1 — Piston stop
- 2 — Compensator spring
- 3 — Rest nut
- 4 — Crimped rubber ring
- 5 — Crimped ring
- 6 — Piston body

Fig. 28 — RECUPERATOR
FILLING VALVE

- 1 — Cover fastening screw
- 2 — Cover
- 3 — Valve plug
- 4 — Valve body
- 5 — Safety screw
- 6 — Regulation nut
- 7 — Copper jointing
- 8 — Rubber jointing
- 8a — Rubber jointing

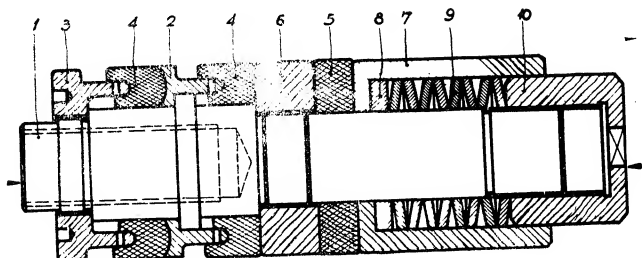


Fig. 29 — FLOATING PISTON

- 1 — Piston body
- 2 — Crimped ring
- 3 — Nut
- 4 — Crimped rubber ring
- 5 — Rubber jointing
- 6 — Rest nut
- 7 — Bronze bushing
- 8 — Washer
- 9 — Bellville springs
- 10 — Spring tightening nut

B. THE HYDRAULIC RECOIL BRAKE AND PNEUMATIC RECUPERATOR /Fig. 22, 23, 24, 25, 26/

The hydraulic recoil brake and the recuperator for the hydro-elastic connection of the barrel with the carriage. With their work after firing the round they absorb the major portion of the recoiling energy, which appears as the result of propellant gas action on the breechblock face. During this the hydraulic recoil brake and the recuperator with the aid of the muzzle brake on the weapon gradually absorb the recoiling energy and thereby reducing the length of the recoiling parts to the rear. The recuperator, after absorption of the recoiling energy returns the barrel in battery position.

The recoil brake is a hydraulic type, that is to say it contains fluid, which flows through small openings and creates resistance, thus decreasing the strength of the recoil. Beside the fluid, the recoil brake cylinders contain a piston with a piston rod, a piston with a counter-piston rod, a spring-activated compensator and an adjusting rod for the recoil-length.

The recuperator is a hydropneumatic one, what means that the recuperating cylinder contains fluid and azote. Only the weapons of models B-1 and B-1A2 were filled with compressed air. Further use of compressed air in the recuperators is prohibited owing its harmful effect. The air may be used exceptionally only during the War when no azote is available and only with the approval of the responsible Superior. As soon as the situation permits, the air should be replaced with azote. The recuperator is provided with a counter recoil speed regulator and a floating piston.

1 - The hydraulic recoil brake /Fig. 22 and 26/

The hydraulic recoil brake is located in the right cylinder and in the portion of the middle cylinder in front of the bulkhead.

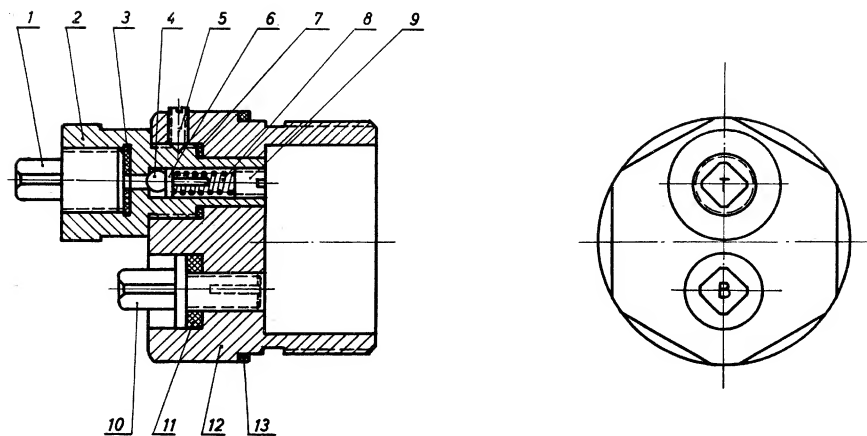


Fig. 28a — FLUID ADDING VALVE BOX — RECOIL BRAKE

- | | |
|-------------------------|-------------------------|
| 1 — Fluid valve plug | 8 — Valve spring |
| 2 — Valve body | 9 — Stop screw |
| 3 — Jointing | 10 — Air relasing valve |
| 4 — Pellet | 11 — Rubber jointing |
| 5 — Safety screw | 12 — Valve box body |
| 6 — Pellet pusher | 13 — Copper jointing |
| 7 — Valve body jointing | |

The hydraulic recoil brake consists of :

- the recoil cylinder
- the piston rod with the piston
- the counter piston rod with the piston
- the compensator
- two recoil cylinder stuffing boxes
- a compensator cylinder stuffing box with the fluid adding valve in the hydraulic recoil brake, and
- the fluid.

The brake is provided with a recoil-length adjuster and with a counter recoil shock absorber on the counter piston rod.

a - The piston rod with the piston. The piston rod is hollow to allow the inserting of the counter piston rod; attached to its front end is the piston.

b - The counter piston rod with the piston. The counter piston rod is cylindrical in shape, in its inner part it is hollow for one half of its length. Screwed onto its rear end is the piston with the counter recoil shock-absorber. In the counter piston rod there are four longitudinal grooves of various cross-sections. Through two of them passes the fluid during recoil, when firing with great elevation.

The piston of the counter piston rod is hollow and in it is the valve with its spring. Screwed onto the end of the piston is the shock-absorber. The valve with its spring and the shock-absorber perform the shock-absorbing during counter recoil.

The valve spring keeps the valve in its seat on the piston. The valve has the function of permitting the fluid to pass, during recoil, into the inner part of the piston rod, and to close the hole on the piston during counter-recoil, so that the fluid flows only through the four holes on the valve into the inner part of the counter-piston rod.

The shock absorber is screwed onto the piston

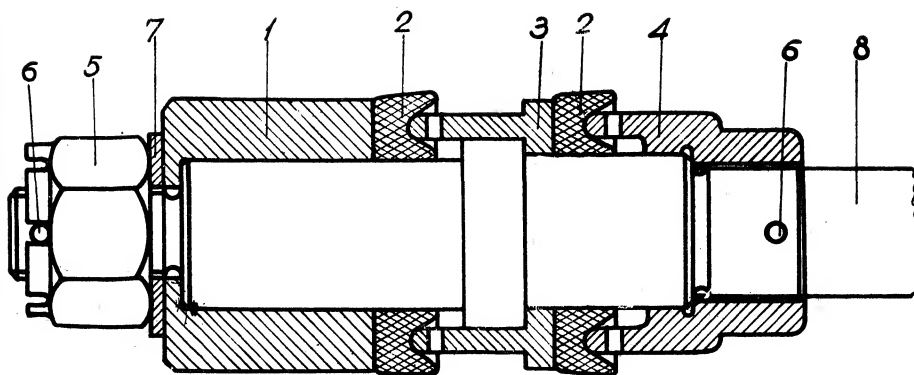


Fig. 30 — RECUPERATOR PISTON — ASSEMBLY

- | | |
|-----------------------------|----------------------------|
| 1 — Bronze guide | 5 — Piston nut |
| 2 — Crimped rubber jointing | 6 — Pin |
| 3 — Undercrimped ring | 7 — Washer |
| 4 — Jointing tightening nut | 8 — Recuperator piston rod |

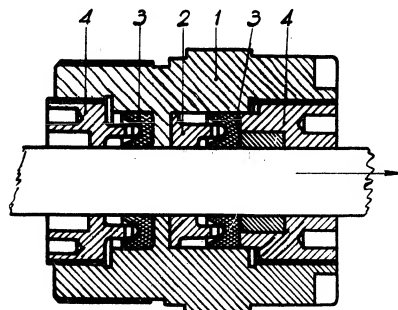


Fig. 31 — RECUPERATOR STUFFING BOX — ASSEMBLY

- | | |
|-------------------------|---------------------------|
| 1 — Box body | 4 — Nut |
| 2 — Under crimped ring | 5 — Nut with crimped ring |
| 3 — Crimped rubber ring | |

head. Its function is to prevent shock during counter-recoil of the barrel. This function is carried out during the last eight centimeters of counter-recoil. In its head the shock absorber is provided with three longitudinal square slits designed to permit the flowing of the fluid. It is hollow in its inner part to allow the valve to enter during recoil. This hollow part has four openings to let out the fluid.

The shock absorber is provided with four longitudinal semicircular slots of different depth. The shock-absorber guided through the piston rod by a brass ring, attached to the piston rod extension.

c - The compensator /Fig. 22, 26 and 27/ has the function of receiving the surplus fluid from the recoil cylinder, originating from heating in order to refill the space from where the piston retracts in recoil to prevent building up of a vacuum. The compensator contains approximately 50 ccm of reserve fluid. The compensator is spring-activated. It consists of a spring and a piston, the spring being a spiral one. The piston consists of a head, a steel-ring, a rubber ring, a nut for compressing the rubber ring and a stop-bolt. The compensator is located in the front part of the middle cylinder.

d - The stuffing boxes of the recoil cylinder. There are two stuffing boxes, one of them stuffing the rear end of the cylinder /Fig. 33/, preventing the fluid to get out along the recoil brake piston rod, the other one designed for the front part of the cylinder /Fig. 32/, preventing the fluid to flow out along the counter piston rod. Located in each box is a rubber ring, a packing, two compressing rings, and a nut.

e - The compensator cylinder stuffing box is provided with two holes, one of them marked with "T" /for "fluid"/ and the other one marked with "V" /for "azote"/. The "T" marked hole is designed as a valve for resupplying fluid into the recoil brake /cylinder/, and the "V" marked hole - for permitting the azote to escape during refilling

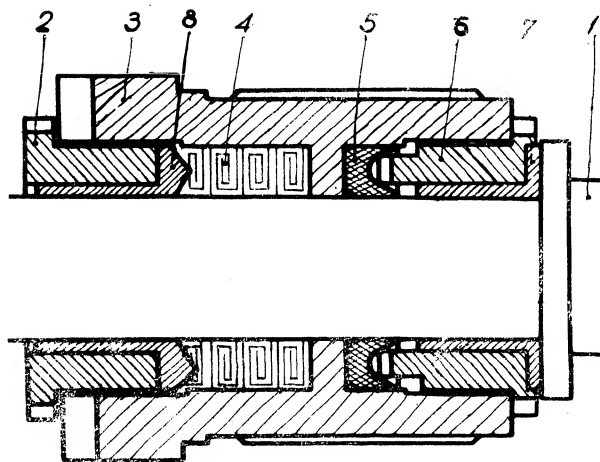


Fig. 32 — RECOIL BRAKE FRONT STUFFING BOX ASSEMBLY

- | | |
|-------------------------------|-------------------------|
| 1 — Counter recoil piston rod | 5 — Crimped rubber ring |
| 2 — Regulating nut | 6 — Nut |
| 3 — Stuffing box body | 7 — Bronze bushing |
| 4 — Talloved wick | 8 — Bronze pusher |

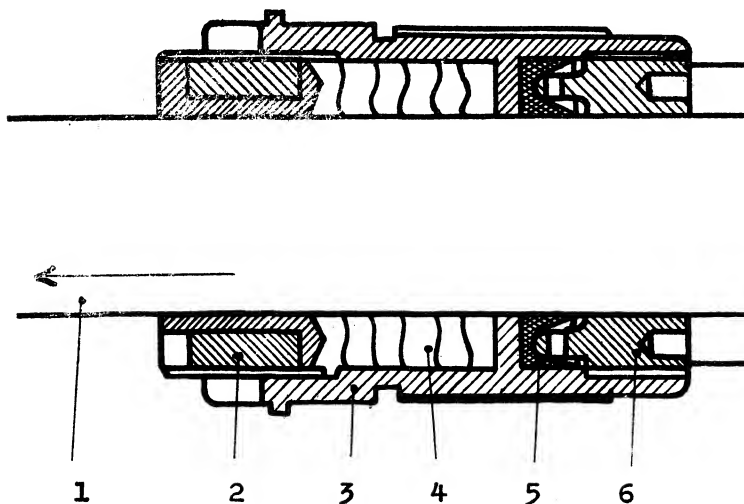


Fig. 33 — RECOIL BRAKE REAR STUFFING BOX ASSEMBLY

- | | |
|-----------------------------|-------------------------|
| 1 — Recoil brake piston rod | 4 — Talloved wick |
| 2 — Nut | 5 — Crimped rubber ring |
| 3 — Stuffing box body | 6 — Nut |

of the recoil cylinder.

Through the "T" marked valve the reserve fluid is supplied under pressure /appr. 50 ccm/. The "T" marked valve for the supply of reserve fluid into the recoil cylinder consists of a body, a spring, a ball, a rubber seal, and a safety plug.

The checking and fluid adding method in the hydraulic recoil brake is described in the section "Checking the quantity of fluid in the recoil brake".

f - The recoil-length adjusting rod /Fig.36a,36b/ and 37/ is on the right side of the cradle. With one of its ends the adjusting rod is linked to the counter piston rod by means of a gear, and with the other it is linked to the top carriage through the roller. The adjusting rod has the task to control the openings of the holes on the piston, narrowing the holes with the increasing of the elevation, as a result of which the recoil is shortened.

The adjusting rod consists of :

- a rod of two parts connected with a nut for the adjustment of the counter piston rod hole,
- a shaft with a gear pin, and a toothed rack,
- a tooth rack with a ring for connection with the counter piston rod,
- two locking rings on the counter piston rod, and
- a nut with a washer.

The adjusting nut is locked on both sides by lock-nuts.

On the front square part of the rod is a scale in millimeters, and on the rod bracket there is a mark for checking the position of the recoil-length adjusting rod in relation to the counter piston rod. Attached to the rear end of the rod is the roller sliding over the link in the top carriage, its front end being reinforced by teeth connecting the rod over a gear and the tooth rack with the counter piston rod.

The hydraulic recoil brake fluid

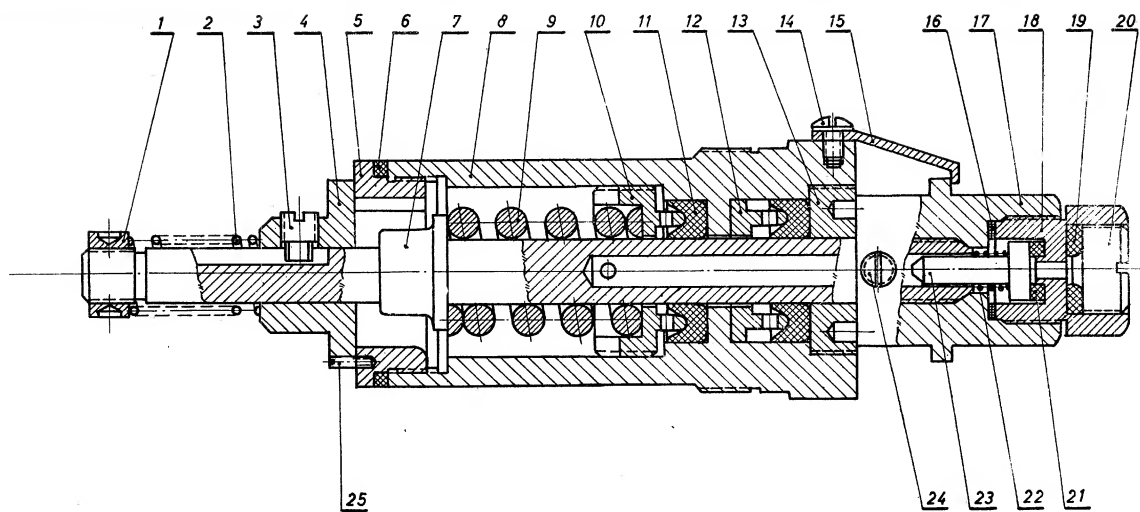


Fig. 34 — COUNTER RECOIL SPEED REGULATOR

- | | |
|------------------------------|-----------------------------|
| 1 — Nut | 14 — Screw |
| 2 — Spring | 15 — Indicator |
| 3 — Stop screw | 16 — Jointing |
| 4 — Valve | 17 — Regulator head |
| 5 — Nut | 18 — Fluid adding valve box |
| 6 — Jointing | 19 — Jointing |
| 7 — Regulator shaft | 20 — Plug |
| 8 — Regulator casing | 21 — Jointing |
| 9 — Spring | 22 — Spring |
| 10 — Crimped ring | 23 — Valve |
| 11 — Crimped rubber jointing | 24 — Safety screw |
| 12 — Under crimped ring | 25 — Stop screw |
| 13 — Nut | |

In weapons models B-1 and B-1A2 the hydraulic recoil brakes were filled with 1.2 kg of Glycerine fluid "Steol J". Further use of this fluid is prohibited and must be replaced with the same quantity of Glycerine fluid "Steol MM".

By weapons having glycerine fluid "Steol J" in their recoil systems, until the replacement with "Steol MM" is made, any addition of fluid, if necessary, should be made from the "Steol J" brand. Mixing of these two brands of fluid is not permissible.

In weapon model B-1A1-I the hydraulic recoil brake is filled with 1.2 kg of glycerine fluid "Steol MM" and any additions in the recoil system must be from this brand.

Both fluids have the identical physical characteristics and therefore when changing from "Steol J" to "Steol MM" no adjustment of the hydraulic recoil brake is necessary.

2 - The pneumatic recuperator

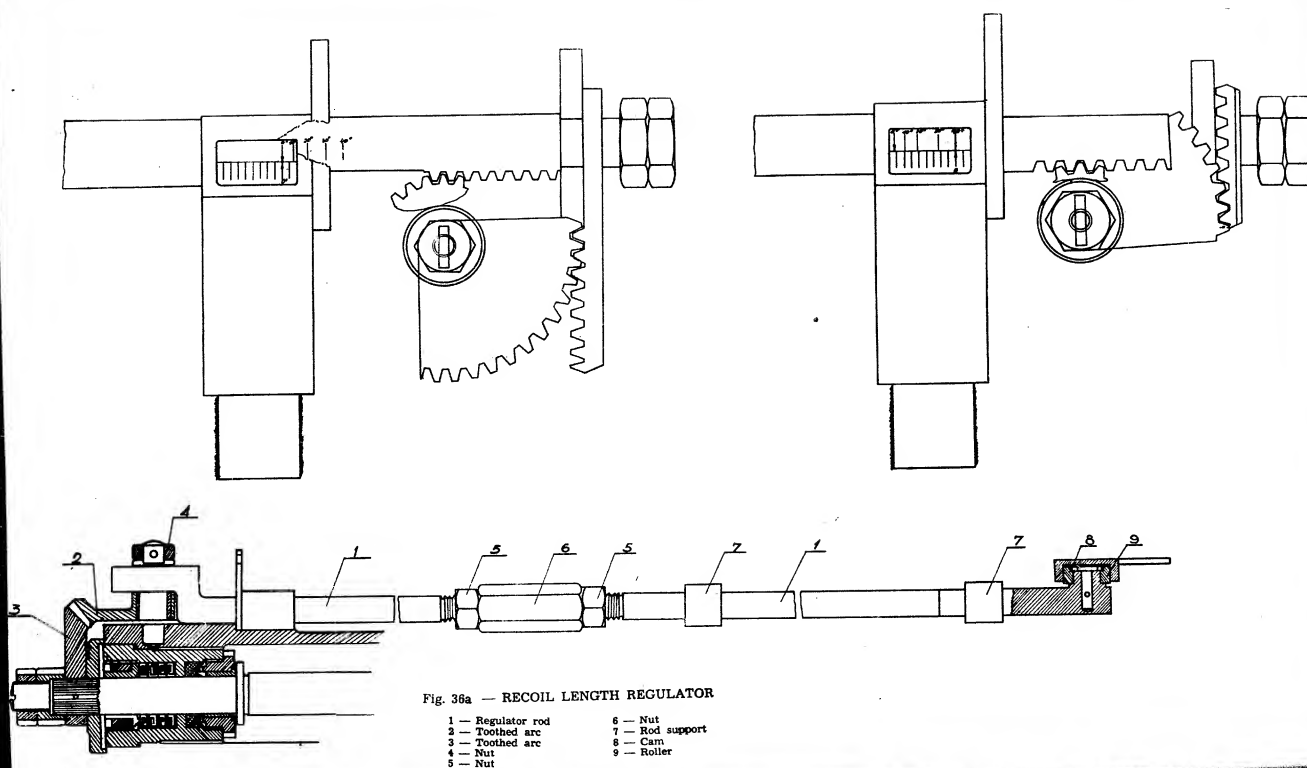
/Fig. 22 - 26/

The pneumatic recuperator is located in the left cylinder, and in the rear portion of the middle cylinder /beyond the bulkhead/.

It consists of :

- the outer cylinder
- the inner cylinder
- the floating piston cylinder
- the piston rod with the piston
- the floating piston
- the stuffing box with the counter-recoil speed-regulator
- the valve case for azote supply
- the recuperator stuffing box
- the left cylinder front cover
- the fluid
- the azote.

Screwed into the left cylinder in the cradle is the inner cylinder. The azote is in the inner cylinder, and



in the middle cylinder in front of the floating piston. The inner cylinder is provided with a hole for permitting the fluid to enter that part of the middle cylinder which is beyond the floating piston and vice versa. In the inner and in the middle cylinder beyond the floating piston there is fluid. On the front part of the outer cylinder /on the left front side of the cradle/ in the valve case for filling azote into the recuperator. Normal pressure in the recuperator amounts to 62 atm.

In the middle cylinder there is the floating piston.

On the rear side of the middle cylinder is the stuffing box with the counter-recoil speed regulator.

The piston rod is cylindrical with the piston on the front end, and the buffer on its rear end. The piston consists of a brass head, two rubber rings, a steel ring, a nut for tightening the rubber rings, and the piston nut /Fig.30/.

The buffer is made of rubber.

Screwed into the rear end is the piston rod extension having a circular groove designed as a seat for the breechring linking lever.

a - The floating piston /Fig.29/ is in the middle cylinder; it separates the fluid from azote in the recuperator.

It consists of :

- the piston body
- the steel ring
- two rubber rings
- the tightening nut for the rubber rings
- the rubber stuffing ring
- the brass nut
- the brass bushing
- the washer
- four pairs of Belleville springs, and
- the spring retainer.

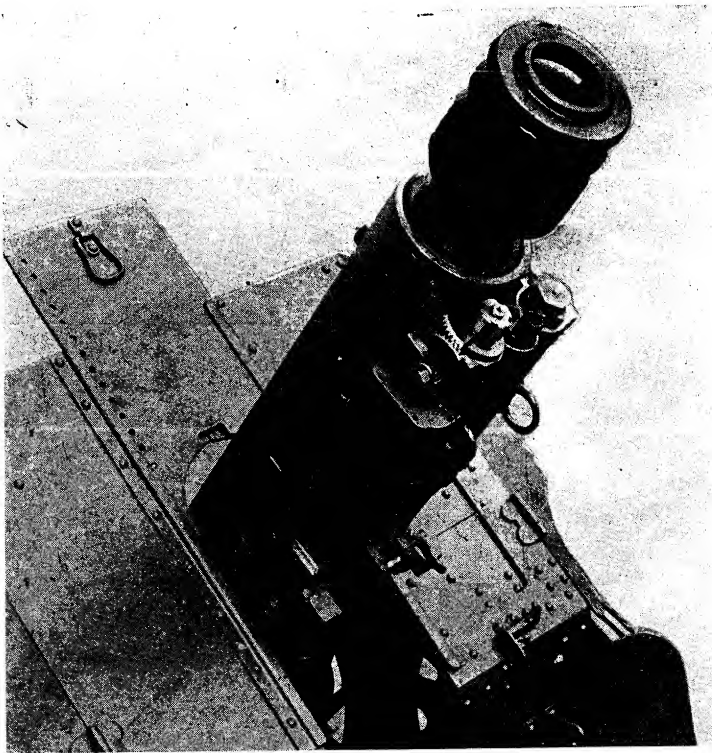


Fig. 36b — THE RECOIL LENGTH REGULATOR — POSITION OF TOOTHED ARC AT ELEVATION OF 45°

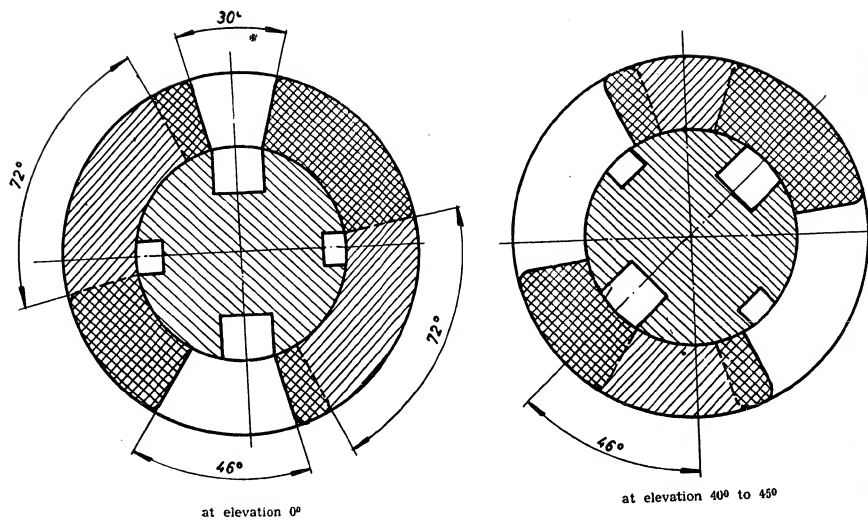


Fig. 37 — CORRECT POSITION OF THE COUNTER PISTON ROD

40

b - The stuffing box with the counter-recoil speed regulator /Fig. 34/ serves for sealing the middle cylinder and controlling the speed of counter-recoil and adding and checking of fluid in the recuperator.

It consists of :

- the case
- the shaft
- the shaft spring
- the steel ring
- two rubber rings
- two tightening nuts for the rubber rings
- the steel ring for tightening the rubber gasket
- the shaft spring
- the rubber gasket
- the valve with a spring and nut
- the valve regulator
- the index
- the fluid re-filling valve in the recuperator providing a passage for the fluid, and
- two attaching screws for attaching the index.

The valve has six holes for the passage of the fluid during counter-recoil. The valve spring has the function of pressing the valve against the front ring; during counter-recoil the valve cannot turn around its shaft, being fixed by the guiding screw, thus being able to turn only along the shaft and to move longitudinally.

The valve regulator has the function of controlling the valve. It shows the markings : "N" - normal, "O" - open, and "Z" - closed. The regulator is attached to the shaft. Its action is transmitted to the valve through the shaft and it brings the valve openings to face the arc-shaped split in the front ring. If the regulator is in the "N" position, the fluid can return through three holes, if in the "O" position - through 6 holes, and if in the "Z" position - the fluid can return only through the clearance between the valve and the shaft in which case all of the holes of the valve are closed.

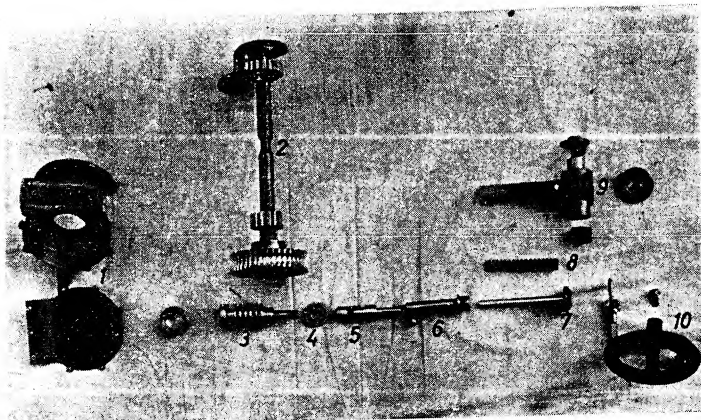


Fig. 38a — ELEVATING MECHANISM

- | | |
|-------------------------------------|-----------------|
| 1 — Gear case | 6 — Spindle |
| 2 — Shaft with pinion and worm gear | 7 — Bevel gears |
| 3 — Worm | 8 — Spring |
| 4 — Ball bearing | 9 — Bracket |
| 5 — Joint | 10 — Handwheel |

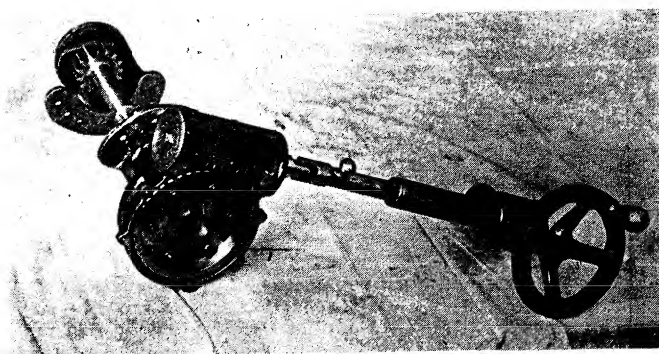


Fig. 38b — ELEVATING MECHANISM ASSEMBLY

The recuperator fluid refilling valve is located in the rear portion of the regulator shaft and consists of the valve spring, the rubber gasket, the pump bearing bracket, the leather gasket, and the valve locking screw.

Showing of the quantity of fluid in the recuperator is performed by means of the regulator in the following manner :

The regulator shaft spring is pressing the valve shaft forward with a force which is sufficient to keep the same always in the forward position in spite of the Compressed azote pressure. Only due to shortage of fluid in the recuperator, when the floating piston rests on the shaft, the shaft moves to the rear compressing its spring. The movement of the shaft to the rear creates a space between the fluid adding valve head and the rear surface of the regulator body box. As soon as the separation of the valve head from the box is noticed it is the sign of fluid shortage in the recuperator./Method of fluid adding is described in a separate section/.

c - The recuperator stuffing box /Fig.31/ has the function of sealing the recuperator cylinder on its rear end.

It consists of the box case, a steel ring, two rubber rings and two rubber ring tightening nuts.

d - The left cylinder front cover closes the front opening of the recuperator cylinder. It is provided with a hole permitting the azote to enter the cylinder during recoil, and to escape during counter-recoil in order to prevent building-up of a vacuum or a compression during counter-recoil.

C. THE POSITION OF THE PARTS OF THE RECOIL BRAKE AND THE RECUPERATOR DURING RECOIL

/Fig. 24/

During recoil, the recoil brake piston rod moves with its piston together with the barrel. As a result

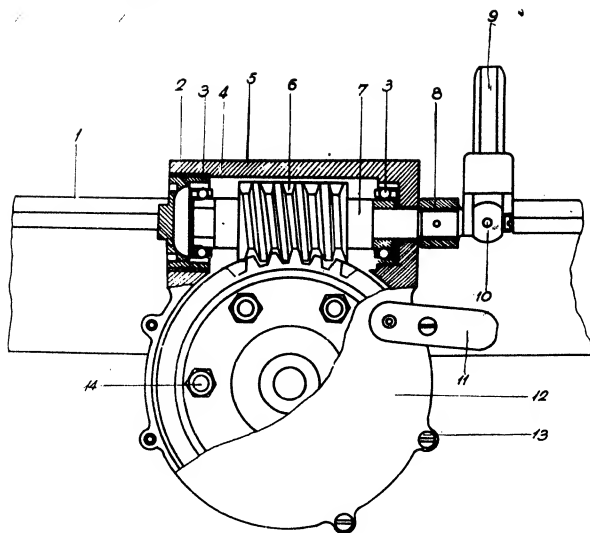


Fig. 39a — BARREL ELEVATING MECHANISM ASSEMBLY

- | | |
|----------------------------|-------------------------|
| 1 — Mechanism wheel | 9 — Screw |
| 2 — Wheel handle | 10 — Nut |
| 3 — Gear case body | 11 — Cartridge web |
| 4 — Bronze bushing | 12 — Guide |
| 5 — Disc shaped gear | 13 — Spring |
| 5a — Bevel gear | 14 — Bronze bearing |
| 6 — Disc shaped gear shaft | 15 — Casing |
| 7 — Casing cover | 16 — Casing with a knob |
| 8 — Bevel gear shaft | 17 — Pin |

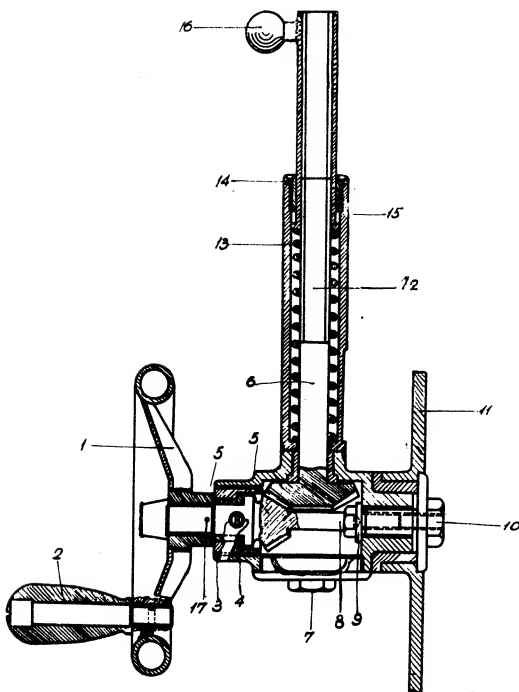


Fig. 39b — ELEVATING MECHANISM
WORM BOX ASSEMBLY

- | |
|--|
| 1 — Cradle |
| 2 — Ball bearing support |
| 3 — Ball bearing |
| 4 — Worm wheel |
| 5 — Box body |
| 6 — Worm |
| 7 — Worm wheel shaft |
| 8 — Threaded bushing |
| 9 — Worm wheel shaft connector |
| 10 — Joint |
| 11 — Worm wheel shaft connector fastener |
| 12 — Box cover |
| 13 — Cover screws |
| 14 — Worm wheel screw |

of the piston's motion the fluid is forcing its way through the holes in the piston and the longitudinal grooves of the counter piston rod in front of the piston. The more the piston rod moves to the rear the greater a vacuum is being built up in front of the counter piston rod in the inner part of the piston rod so that the fluid enters through the grooves and the through holes into the counter piston rod, exerting pressure against the valve, opening the latter and flowing through the shock absorber into the inner part of the piston rod. Since the diameter of the counter piston rod is by 1 mm smaller than the inner diameter of the piston rod, during the motion of the piston backwards, the fluid flows also around the counter piston rod itself into the inner part of the piston rod.

The flow openings through which the fluid flows are the holes in the piston and the grooves in the counter piston rod, and they are biggest in the beginning and then they grow smaller with the length of recoil, because the shorter grooves of the counter piston rod get shallower. The holes in the piston of the counter piston rod remain unchanged during recoil. The valve permits the fluid to flow during recoil and closes the middle opening in the counter piston rod during counter recoil so that the fluid can pass only through the holes in the valve, thus retarding the counter-recoil.

Owing to the retraction of the recoil brake piston, the compensator fills the recoil-cylinder, during the recoil, with reserve fluid, thus preventing building up of a vacuum. During firing the compensator is in continuous operation. The compensator contains about 50 ccm of reserve fluid.

a - The position of the recuperator parts

During recoil together with the barrel recoils also the recuperator piston rod with its piston. Not having any opening the recuperator piston presses the fluid out of the inner cylinder to the rear and through the opening into the middle cylinder. In the middle cylinder the fluid

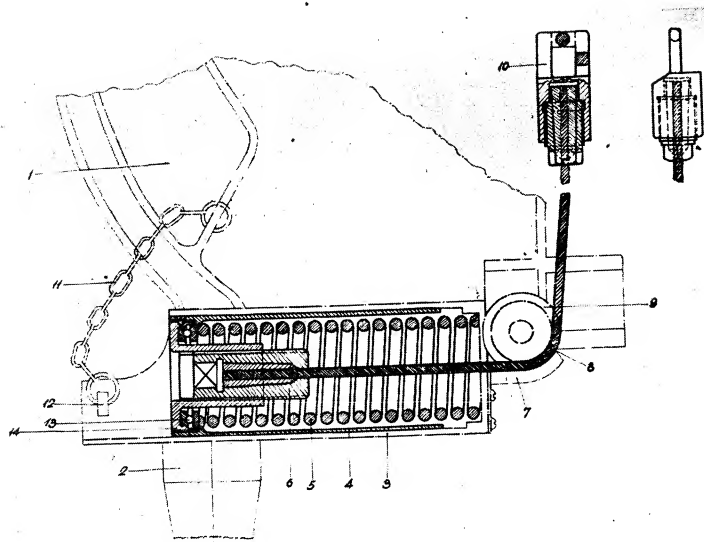


Fig. 40a — EQUILIBRATOR

- | | |
|---------------------------------|---|
| 1 — Portion of top carriage | 9 — Pulley |
| 2 — Carriage pintle | 10 — Steel wire rope attaching head to the cradle |
| 3 — Equilibrator cylinder | 11 — Chain |
| 4 — Equilibrator bronze bushing | 12 — Bolt |
| 5 — Equilibrator spring | 13 — Ball bearing |
| 6 — Steel wire rope fixing head | 14 — Nut |
| 7 — Steel wire rope shield | |
| 8 — Steel wire rope | |

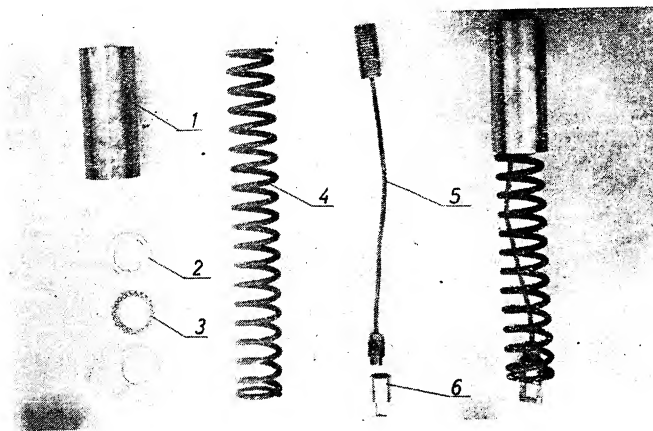


Fig. 40b — EQUILIBRATORS — Wiew

- | | |
|------------------|-------------------------|
| 1 — Inner tube | 5 — Cable |
| 2 — Ring | 6 — Cable attaching eye |
| 3 — Ball bearing | |
| 4 — Spring | |

passes through the counter-recoil speed regulator exerting pressure against the valve, compressing its spring and flows into the space beyond the floating piston. The pressure of the fluid against the floating piston moves the latter forward. The floating piston compresses the azote in the middle cylinder and also in the outer recuperating cylinder in the left hollow part of the cradle.

By passage of the fluid through the valve and by compressing the azote in the recuperator, the recuperator helps the action of the recoil brake, at the same time accumulating energy to return the barrel in battery.

The recoil energy is diminished not only by the recoil-brake and the recuperator, but also by the muzzle-brake and by the friction of the recoiling parts.

D. THE POSITION OF THE RECOIL BRAKE AND THE RECUPERATOR

PARTS DURING COUNTER-RECOIL

/Fig. 25/

a - The position of the recuperator

During counter-recoil the main action is performed by the recuperator. By the compression of azote during the recoil, the recuperator has accumulated so much energy, that the counter-recoil would be performed too violently. To avoid this, during counter-recoil, the speed regulating valve and the shock-absorber located in the piston of the recoil brake counter piston rod are acting.

After the barrel has stopped at the end of the recoil the compressed azote in the recuperator tends to expand and with its pressure acts on the floating piston in the middle cylinder, the main energy is in the recuperator and, the force of recoil having been overcome, the azote in the outer recuperator cylinder tends to expand. Since the middle cylinder is connected with the outer cylinder, the azote exerts pressure against the floating piston in the middle cylinder, too. The floating piston pushes, under azote pressure, the fluid in the middle cylinder, so that the fluid, passing through the counter-recoil

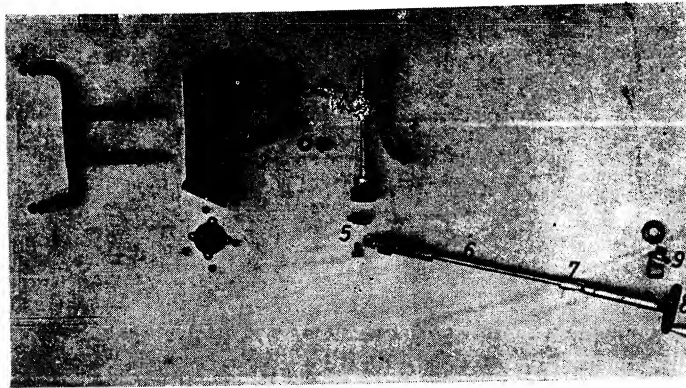


Fig. 41 — TRAVESING MECHANISM

- | | |
|---------------------|---------------|
| 1 — Shield bracket | 6 — Shaft |
| 2 — Gear case | 7 — Joint |
| 3 — Worm gear arc | 8 — Handwheel |
| 4 — Shaft with worm | 9 — Bracket |
| 5 — Bevel gears | |

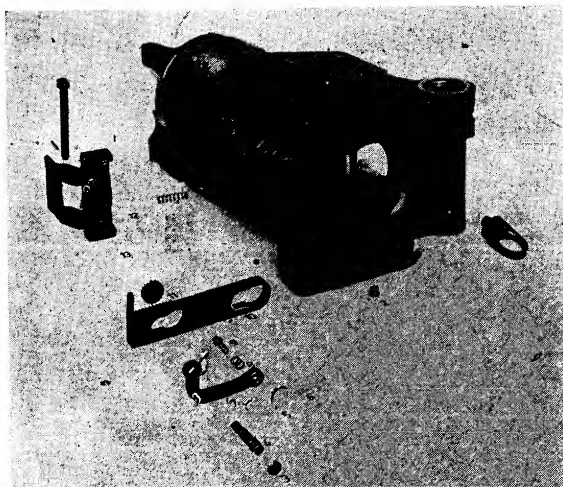


Fig. 5c — BREECHRING WITH BARREL AND HYDRAULIC RECOIL
BRAKE CONECTION

speed regulator into the inner recuperating cylinder, pushes the recuperator piston forward. Having free space, the recuperator piston moves forward, pulling along the recuperator piston rod, the latter pulling the breechring to which it is attached.

From the inner cylinder the fluid does not return through all the holes of the counter-recoil speed regulator through which is passed during recoil.

The counter-recoil speed regulator is designed to retard the returning of the fluid and to enable the gun crew to control it.

During the returning of the fluid the counter-recoil speed regulating valve, under the action of its spring, presses against the front ring of the box so that the fluid cannot pass through the clearance between the front ring and the valve but must pass through the valve holes.

The resistance being overcome by the fluid, passing through the valve, prevents the azote from developing its full energy at once and from returning the barrel in battery too rapidly.

The fluid need not always pass through all of the holes, but the flow is regulated by means of the stuffing box regulator of the middle cylinder. By means of the wrench depending on the temperature of the fluid, i.e. the recuperating speed.

b - Adjusting of the counter-recoil speed regulator /Fig. 36a and 36b/

On the counter-recoil speed regulating valve there are six holes provided for the passage of the fluid during the counter-recoil.

On the ring of the regulator there are marks :
"O" - "N" - "Z" - meaning : Open, Normal, Closed.

When assembling the recuperator, the ring of the regulator is adjusted so that the mark "N" faces the index, meaning that the fluid may pass only through three holes, the remaining three being closed. Should the recuperator

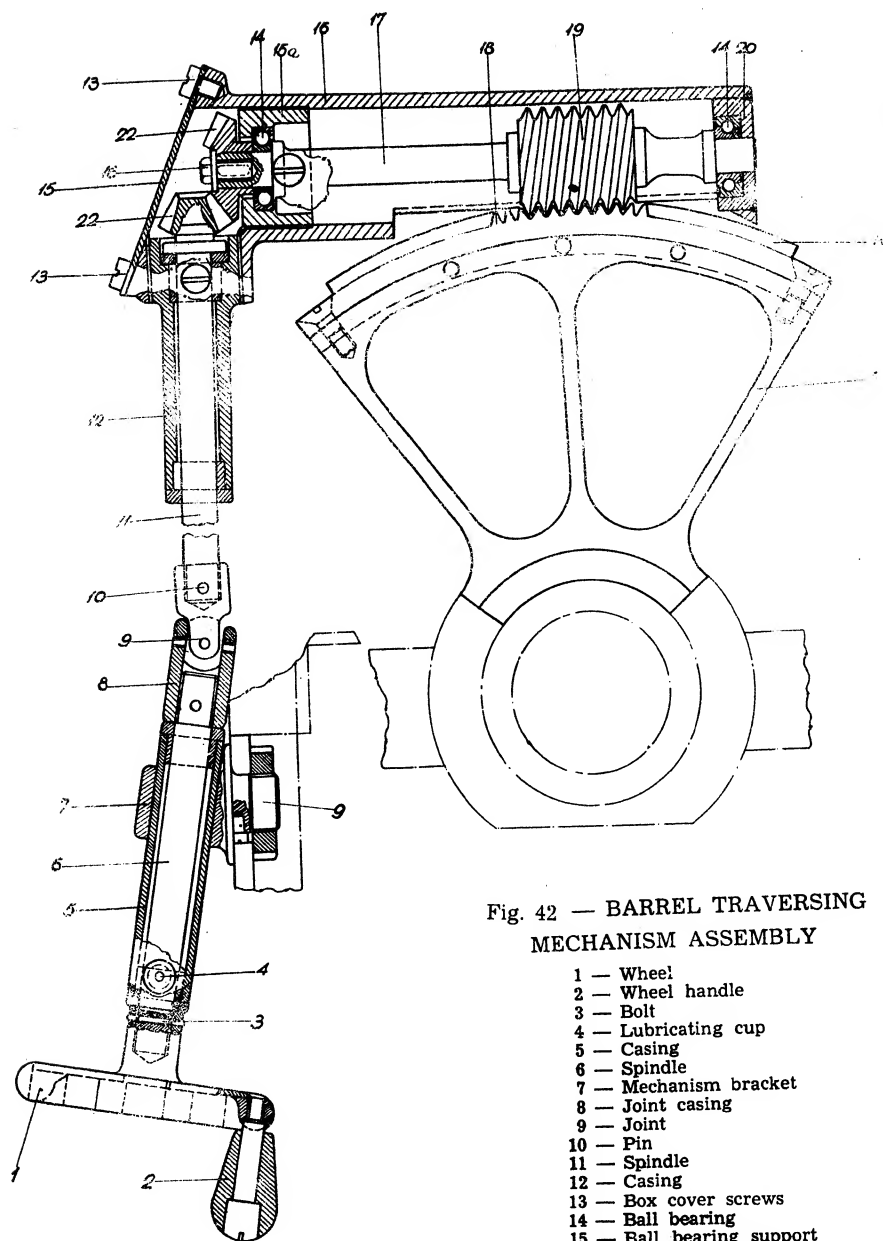


Fig. 42 — BARREL TRAVERSING
MECHANISM ASSEMBLY

- 1 — Wheel
- 2 — Wheel handle
- 3 — Bolt
- 4 — Lubricating cup
- 5 — Casing
- 6 — Spindle
- 7 — Mechanism bracket
- 8 — Joint casing
- 9 — Joint
- 10 — Pin
- 11 — Spindle
- 12 — Casing
- 13 — Box cover screws
- 14 — Ball bearing
- 15 — Ball bearing support
- 16 — Worm box body
- 17 — Worm shaft
- 18 — Arc rack
- 19 — Worm
- 20 — Ball bearing support
- 21 — Arc rack support
- 22 — Disc shaped gear
- 22a — Bevel gear
- 23 — Bronze bushing

return the barrel too slowly, which normally happens as a result of the thickening of the fluid due to low outer temperature, the regulator must be adjusted to "O", so as to allow the fluid to pass through all of the six holes in order to return the barrel more quickly.

If the barrel returns in battery too quickly, as a result of the deluting of the fluid due to heating up, the ring of the regulator should be adjusted so that the mark "Z" should face the index. The fluid will then pass only through the clearance between the regulator shaft and the valve.

The adjustment of the counter-recoil speed regulator is done with a wrench, bearing in mind that if the wrench is turned to the extreme right, the mark "Z" will face the mark "N", and in the extreme left position the index faces the mark "O".

The self-turning of the regulator is ensured by the index in the manner that the latter's latch is engaged by a corresponding notch which keeps the regulator in the desired position.

c - The position of the recoil-brake /Fig.26/

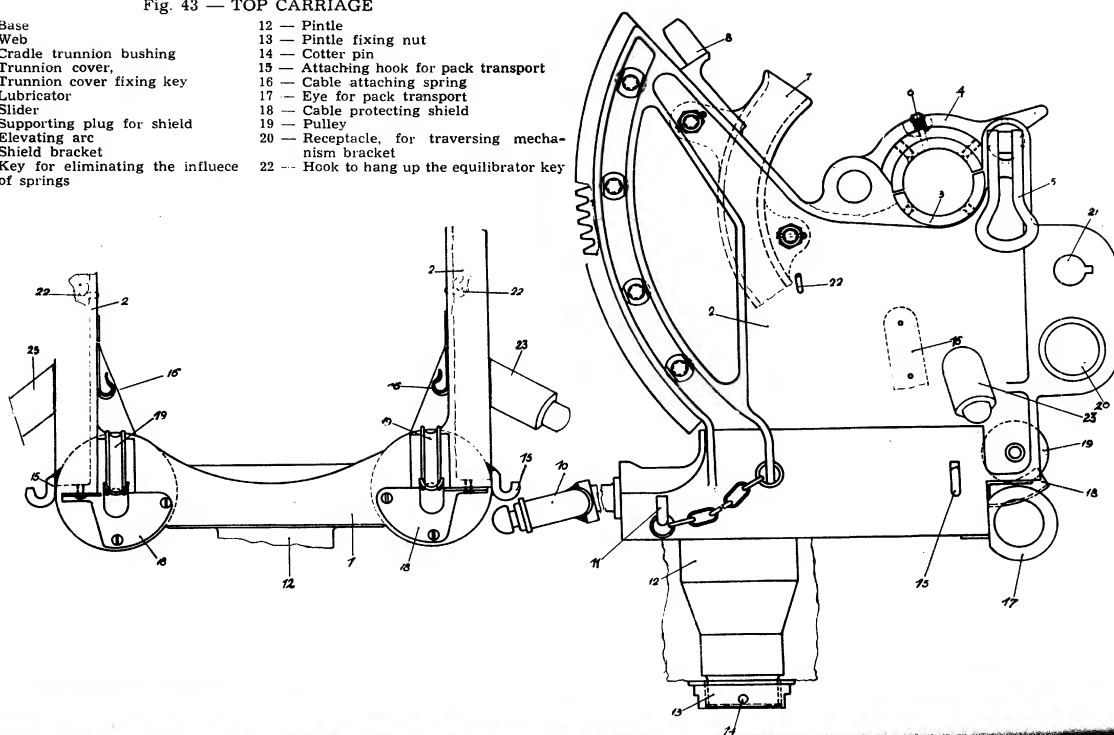
While the recuperator returns the barrel in its battery position, the fluid in the brake, under the action of the recuperator, must pass from the space situated in front of the piston, and from the inner part of the piston rod through the hole in the piston into the brake cylinder beyond the piston.

The brake piston rod being attached to the breech-ring /the latter being pulled forward by the recuperator piston rod/, the brake piston rod with its piston will move forward.

The brake piston forces the fluid from the cylinder passing through the grooves of the counter piston rod and the piston holes into the brake cylinder beyond the piston. In the beginning, the opening holes are smaller and subsequently they become larger, depending on the change of the depth of the grooves in the counter piston

Fig. 43 — TOP CARRIAGE

- | | |
|---|---|
| 1 — Base | 12 — Pintle |
| 2 — Web | 13 — Pintle fixing nut |
| 3 — Cradle trunnion bushing | 14 — Cotter pin |
| 4 — Trunnion cover | 15 — Attaching hook for pack transport |
| 5 — Trunnion cover fixing key | 16 — Cable attaching spring |
| 6 — Lubricator | 17 — Eye for pack transport |
| 7 — Slider | 18 — Cable protecting shield |
| 8 — Supporting plug for shield | 19 — Pulley |
| 9 — Elevating arc | 20 — Receptacle, for traversing mechanism bracket |
| 10 — Shield bracket | 22 — Hook to hang up the equilibrator key |
| 11 — Key for eliminating the influence of springs | |



rod.

Owing to the forward motion of the piston rod the fluid must pass from its inner part through the holes in the counter piston rod valve into the inner part of the counter piston rod, get out through the holes and grooves of the counter piston rod, and pass together with the fluid that was in the front of the piston, through the piston into that part of the cylinder, which is behind the piston and into the compensator.

d - The action of the counter-recoil shock absorber valve

From the inner part the fluid does not return through all the holes in the valve in the same way as it has passed during recoil.

The function of the valve is to soothe the counter-recoil and to serve as a brake against violent motion of the barrel during returning.

Out of the piston rod the fluid passes through the holes into the shock-absorber head, pressing against the valve, closing the hollow part of the counter piston rod, as a result of which the fluid is able to pass only through the small valve holes into the inner part of the piston rod. This passing of fluid through the small valve holes creates resistance which soothes the recuperating action.

From the counter piston rod the fluid enters through three pairs of holes, filling up the grooves in the counter piston rod and together with the remainder of the brake fluid passes through the piston into the part of the cylinder beyond the piston.

e - The action of the counter-recoil shock absorber

The counter-recoil shock absorber prevents the shock of the recoiling parts after completing the recoil, functioning during the last eight centimeters of counter-recoil.

The fluid from the inner part of the piston rod



Fig. 44b — THE BOTTOM CARRIAGE
PARTS — View

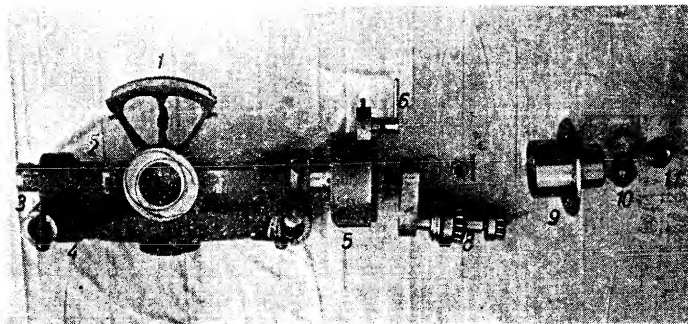


Fig. 45a — AXLE WITH EQUALIZER AND SPRING

- | | |
|---------------------|-------------|
| 1 — Traversing rack | 7 — Spring |
| 2 — Axle | 8 — Bearing |
| 3 — Handle | 9 — Bushing |
| 4 — Equalizer | 10 — Eye |
| 5 — Spring housing | 11 — Cap |
| 6 — Handle | |

and the seat of the shock-absorber, when entering the shock-absorber, flows through its longitudinal grooves. These grooves are of varying depth as a result of which the opening for the passage of the fluid is largest in the beginning and afterwards smaller. From the moment the shock absorber grooves enter the seat, the holes for the passage of the fluid successively vanish, until they completely disappear, in which moment the barrel, too, comes to its initial position.

f - The action of the compensator

/Fig. 24 and 25/

Under the influence of heat created as a result of rapid firing or high outer temperature, the fluid in the brake cylinder expands.

The brake cylinder is entirely filled up with fluid which increases in volume when heated up and exerts pressure against the cylinder walls, tending to leak out along some seal. To prevent this, the brake is provided with a compensator. The compensator has a reserve of 50 ccm of fluid.

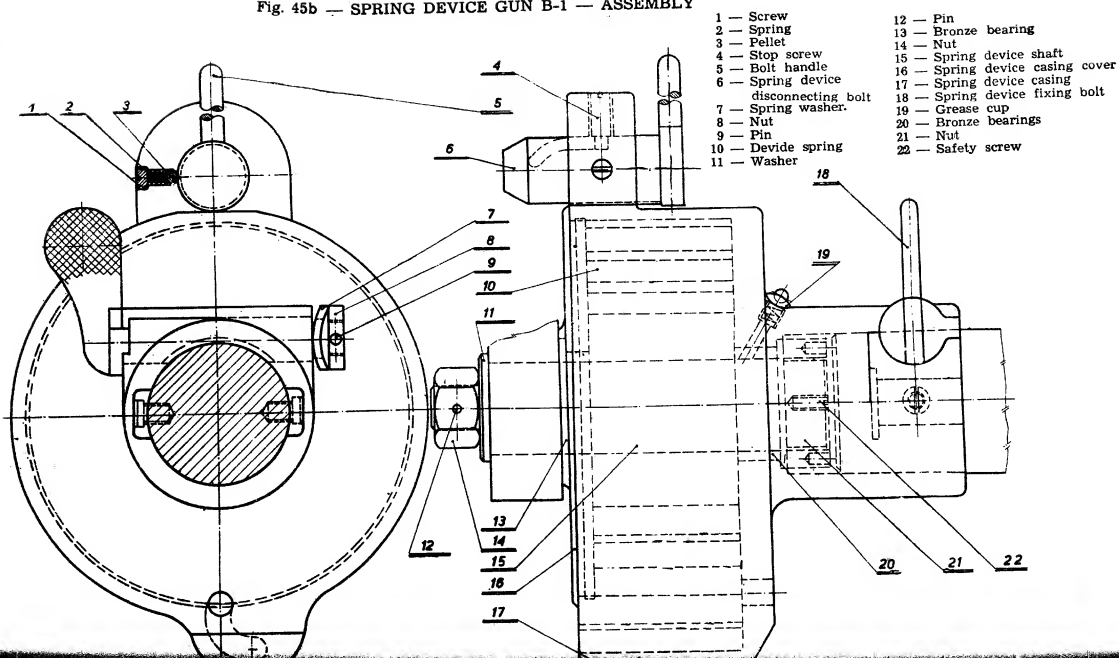
The compensator has the task to receive the fluid surplus, originating from heating up, and to keep the brake permanently full with fluid.

If during firing the fluid heats up and increases in volume, the fluid surplus passes from the recoil brake cylinder through the opening into the front portion of the middle cylinder and presses against the compensator piston, which transmits this pressure to the spring, thus creating space for receiving the fluid surplus.

After the fluid has cooled down and decreased in volume, the piston spring liberated from pressure expands, forces the compensator piston forward and the latter pushes the reserve of fluid back into the recoil brake cylinder, keeping it permanently full.

During firing the compensator is in continuous operation receiving and transmitting fluid for correct operation of the brake.

Fig. 45b — SPRING DEVICE GUN B-1 — ASSEMBLY



If the brake loses a portion of its fluid, then under the influence of the spring on the piston, the reserve fluid is being forced from the compensator into the recoil-cylinder.

When there is sufficient reserve fluid in the compensator, through the opening in the cradle 4 compensator spring threads are visible.

g - The action of the recoil-length regulator
/Fig. 26, 36a, 36b and 37/

The recoil-length regulator has the function :

- of automatically controlling the recoil length at elevations exceeding $+ 10^{\circ}$,
- of permitting the gunner in some special cases, when there is no sufficient fluid or the fluid is heated up, to regulate the recoil length at all angles of elevation, ensuring a normal recoil length with a determined propelling charge and barrel elevation.

1 - Automatic control of the recoil length at angles of elevation exceeding $+ 10^{\circ}$

The recoil length regulator automatically controls the recoil length at angles of elevation exceeding $+ 10^{\circ}$. The greater the elevation, the shorter the recoil.

The roller on the lever of the recoil-length regulator slides over the cam on the inner side of the right carrier of the arc-rack of the top carriage body. During elevating, the roller slides over the cam which, owing to its curve, pulls the lever more and more backwards as the elevation increases. By pulling the lever, the pinion rotates and under its action and the action of the arc-shaped racks the counter piston rod is also turned to the left /in regard to the direction of firing/. By turning of the counter piston rod its grooves shift in relation to the holes on the piston, diminishing the openings for the passage of the fluid and the fluid will flow more slowly to the other side of the piston, and thereby shortening the recoil length.

When the barrel is lowered the work of the re-

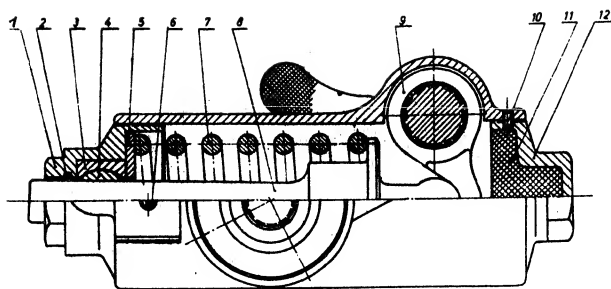


Fig. 45 C

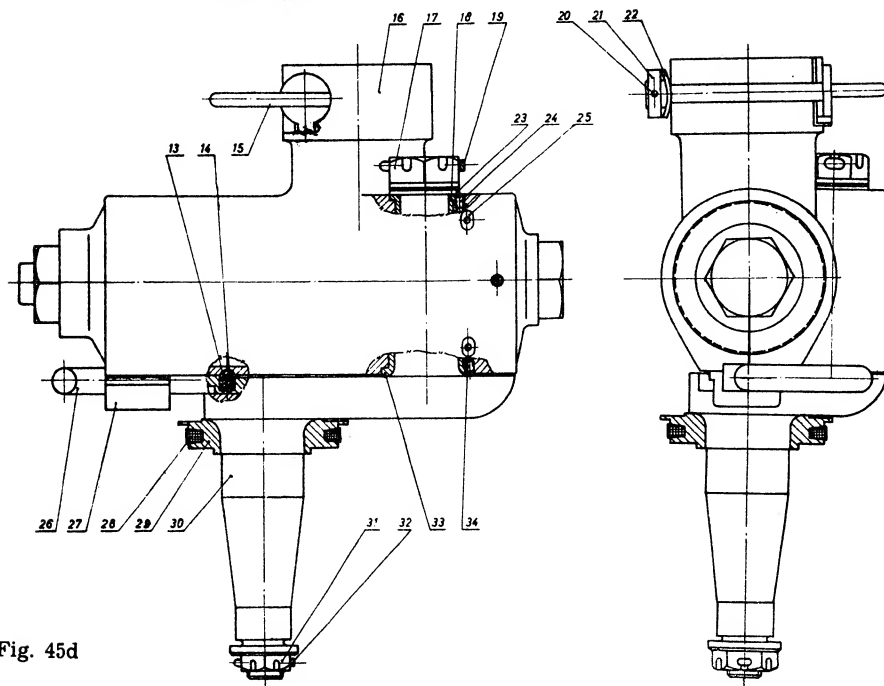


Fig. 45d

Fig. 45d — SPRING DEVICE — GUN B1-A2

- | | |
|--------------------------------------|---|
| 1 — Spring device casing front cover | 19 — Cotter pin |
| 2 — Fett wiper | 20 — Pin |
| 3 — Two part bronze bearings | 21 — Disc |
| 4 — Bronze bearing two part ball | 22 — Spring washer |
| 5 — Washer | 23 — Washer |
| 6 — Safety screw | 24 — Fastening screw |
| 7 — Device spring | 25 — Grease cup |
| 8 — Device spring guide shaft | 26 — Spring device disconnecting bolt |
| 9 — Guide pusher | 27 — Spring device disconnecting bolt slide |
| 10 — Safety screw | 28 — Felt jointing |
| 11 — Rubber buffer | 29 — Felt jointing support |
| 12 — Rear cover | 30 — Semi-axle |
| 13 — Fastener spring | 31 — Wheel tightening nut |
| 14 — Semi-round fastener | 32 — Cotter pin |
| 15 — Device fixing bolt | 33 — Bronze bearing |
| 16 — Spring device casing | 34 — Fastening screw |
| 17 — Semi axle nut | |
| 18 — Bronze bearing | |

coil length regulator is opposite, and the recoil length is longer.

2 - Adjusting the recoil length

In order to enable the gunner to maintain the standard recoil length for the determined propellant charge and barrel elevation, the recoil length regulator is provided with an adjusting nut connecting both parts of the regulator rod.

One part of the rod is threaded anticlockwise and the other one clockwise.

In order to prevent the adjusting nut from turning by itself, the adjusting nut is secured with a lock nut on each part of the rod.

If the index on the carrier is on the "0"/zero/ when the barrel is in horizontal position, then the position of the parts is such as to produce standard recoiling at all angles of elevation.

To shorten the recoil both lock nuts should be loosened, after which the adjusting nut should be turned to shorten the adjusting rod.

By shortening the rod whose motion is transmitted over the pinion and the toothed rack to the counter piston rod, turning the latter to the left /in regard to the direction of firing/, the opening for the passage of the fluid are diminished, shortening the length of recoil.

If during further firing it has been observed that the recoil is too short, and, with the barrel in horizontal position, the mark does not face "0" /zero/, the mark should be adjusted to "0" /zero/ while the barrel is in horizontal position.

By lengthening the adjusting rod the counter piston rod is turned to the right /in regard to the direction of firing/, enlarging the openings for the passage of fluid, thus lengthening the recoil.

The adjusting rod may be shortened only by 2 mm maximum. If the adjusting rod would be shortened more than 2 mm, at greater elevations long

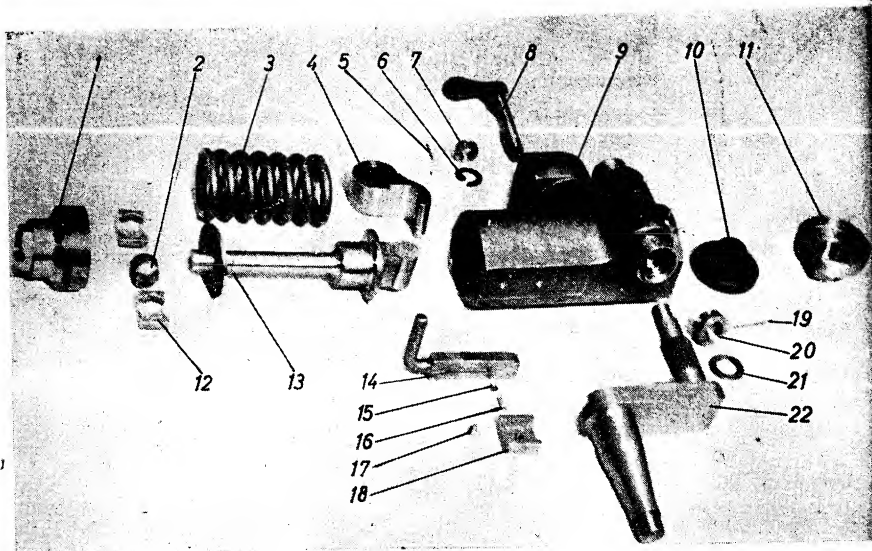


Fig. 45c — SPRING ASSEMBLY B-1 A2, B-1A1-I

- | | |
|--------------------------|-------------------------------|
| 1 — Nut | 13 — Spring device axle |
| 2 — Bronze bearing | 14 — Key for attaching spring |
| 3 — Spring | 15 — Safety screw |
| 4 — Spring device lever | 16 — Spring |
| 5 — Pin | 17 — Stop screw |
| 6 — Spring washer | 18 — Guide |
| 7 — Nut | 19 — Pin |
| 8 — Rotating bolt | 20 — Nut |
| 9 — Spring device casing | 21 — Washer |
| 10 — Rubber buffer | 22 — Elbow shaped axle |
| 11 — Nut | |
| 12 — Ball joint | |

2 mm, at greater elevations long recoil may result because in such a case the openings for the passage of fluid are enlarged.

3 - Checking of the recoil length regulator

In order to enable the gunner to check the controlling action of the recoil speed regulator, a scale is provided on the adjusting rod with elevation angles engraved in degrees.

When elevating the barrel, the scale corresponding to elevation of the barrel must face "0" /zero/ on the carrier. In this case the recoil length regulator functions correctly. In contrary cases the basic position of the regulator should be checked /the barrel horizontal, the basic position mark on the rod facing "0" /zero/ on the carrier.

E. FILLING OF THE RECOIL BRAKE AND THE RECUPERATOR

1 - Filling the recuperator

a - Filling the recuperator with fluid/Complete filling/

Supplying fluid into the recuperator is performed with the cradle in vertical position, its back parts upwards.

To this purpose :

- 1 - Remove the barrel with the breechring and the mantle
- 2 - Remove the azote valve case cover from the recuperator on the left side of the cradle
- 3 - Unscrew the plug from the three-way azote filling fitting
- 4 - Loosen the valve by turning it to the left, to let the azote escape
- 5 - With a socket wrench loosen both nuts which fix the piston rod connector
- 6 - Remove the piston rod connector
- 7 - Unscrew the two screws from the index of the recoil speed regulator

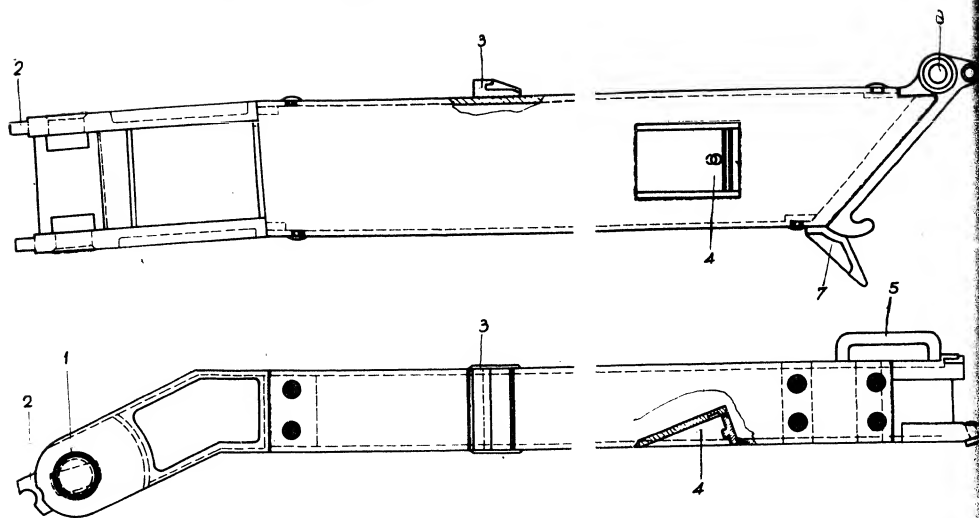


Fig. 46 — FRONT RIGHT TRAIL

- | | |
|--|-------------------------------|
| 1 — Hinge pin bore | 4 — Rear trail connection |
| 2 — Latch for trail lock | 5 — Spreading handle |
| 3 — Latch for fixing the rear trail when assembled | 6 — Rear trail hinge pin bore |
| | 7 — Little spade |

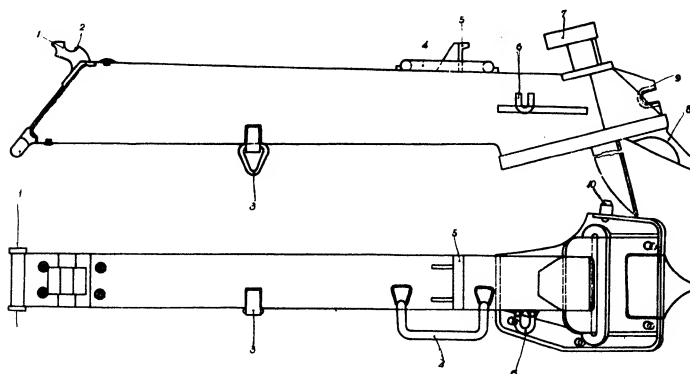


Fig. 47 — REAR RIGHT TRAIL

- | | |
|---|--|
| 1 — Latch for attaching the front trail | 6 — Eye for attaching on pack saddle |
| 2 — Hinge pin bearing | 7 — Spade |
| 3 — Eye for lifting | 8 — Little spade |
| 4 — Spreading handle | 9 — Trail fixing slot |
| 5 — Latch for fixing the front trail when assembled | 10 — Contacting plug when assembled for towing |

- 8 - Remove the index
- 9 - Unscrew with a socket wrench the stuffing box from the middle cylinder
- 10- Before filling with fluid, adjust the floating piston to be 250 mm from the bottom of the rear part of the cylinder
- 11- Insert the funnel with a sieve into the middle cylinder
- 12- Pour 1,24 liters of fluid into the middle cylinder
- 13- Reinstall the stuffing box on the middle cylinder
- 14- Fix the index with two attaching screws
- 15- Install the connector on the piston rod
- 16- Fix the piston rod connector with two nuts
- 17- Reinstall the barrel with the breechring and the mantle onto the cradle

b - Adding fluid in the recuperator

The recuperator contains approximately 165 grams of reserve fluid. If there is reserve fluid in the recuperator then the recuperating speed regulator shaft is located in its seating. If there is a shortage of 140 grams of fluid in the recuperator the shaft remains in place and the firing may be continued until the shortage of fluid in the recuperator exceeds 140 grams. When the shortage in the recuperator exceeds 140 grams then the regulator shaft, owing to pressing of the floating piston, leaves its seating; this being the signal that the shortage of fluid in recuperator is over 140 grams and therefore the fluid should be added. When a total of 165 grams of fluid is lost, the regulator shaft leaves its seating for 8 to maximum 11 mm and when it is in this position the firing must be stopped.

Adding of fluid in the recuperator is done under pressure with a pump. To do this proceed as follows :

- remove the barrel, the breechring and the barrel mantle,
- unscrew the valve safety screw,

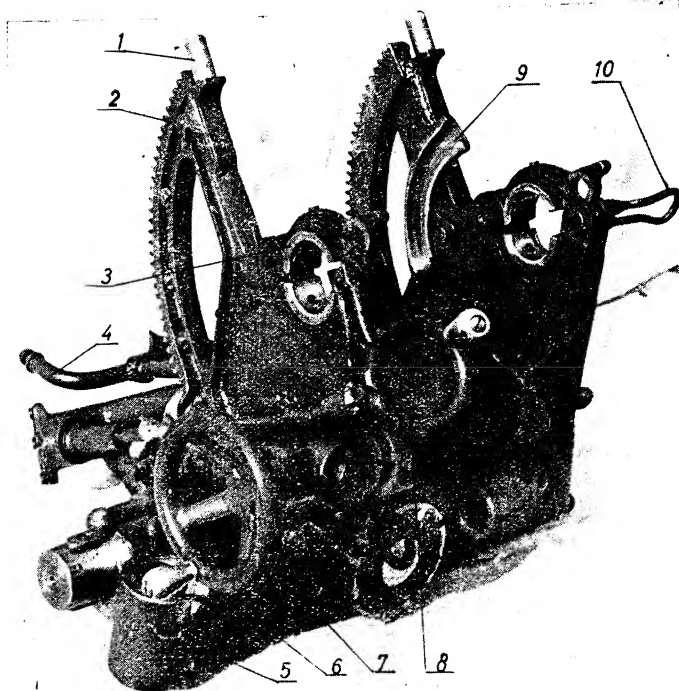


Fig. 48 — TOP CARRIAGE — View

- | | |
|--------------------------|--------------------------------|
| 1 — Upper shield support | 6 — Equalizer bar |
| 2 — Elevation sector | 7 — Elevation mechanism wheel |
| 3 — Shoulder seat cover | 8 — Traversing mechanism wheel |
| 4 — Shield bracket | 9 — Operating cam |
| 5 — Equalizer | 10 — Cover fixing bolt |

- take the pump with fluid and screw it in the shaft,
- pump the fluid through the valve until the regulator shaft returns in place, and then fill 140 grams of fluid more to reach the standard quantity of fluid in the recuperator.

c - Supplying azote into the recuperator

/Fig. 55, 56/

The recuperator is filled with azote only after the adequate amount of fluid has been supplied.

To fill the recuperator with azote it is necessary to

- 1 - Bring the cradle into horizontal position
- 2 - Unscrew the screw and remove the case cover of the azote filling valve
- 3 - Unscrew the plug from the three-way fitting
- 4 - Screw on the three-way fitting with the azote pressure gauge
- 5 - Screw the end of the hose onto the azote pump or onto a high pressure azote cylinder
- 6 - Connect the azote filling hose with the three-way fitting
- 7 - Loosen the valve for one full turn to the left
- 8 - Open the azote supplying cylinder and let the azote into the recuperator.

N O T E : If the recuperator is to be filled from a high pressure azote cylinder, the cylinder valve should be opened slowly. If the supplying cylinder were opened too suddenly, the azote would exert too heavy a pressure against the hose and cause damage. The azote pressure gauge should be apt and have a scale for greater pressure than the maximum pressure in the azote container.

- 9 - Bring the pressure in the recuperator to 62 ± 1 atm.
- 10 - Close the valve
- 11 - Disconnect the hose from the three-way fitting
- 12 - Screw the plug into the three-way fitting
- 13 - Install the cover onto the valve case and fix it.

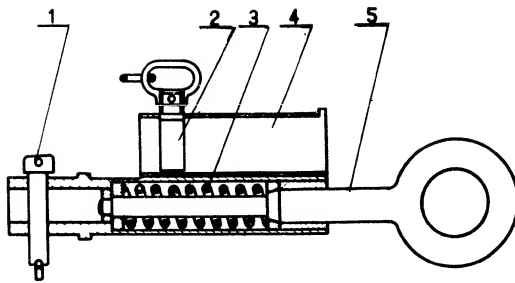


Fig. 49a — LUNETTE — 76 mm
MOUNTAIN GUN M 48 B-1 and B-1A2

- 1 — Lunette fixing bolt to trails connector
- 2 — Thill fork fixing bolt
- 3 — Spring
- 4 — Thill fork seat
- 5 — Eye
- 6 — Trails fixing bolts

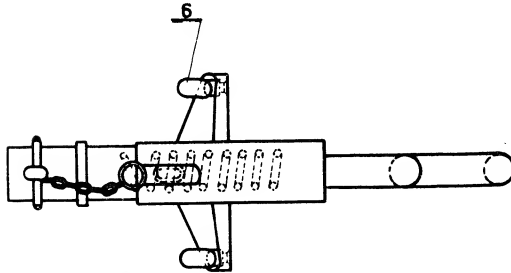
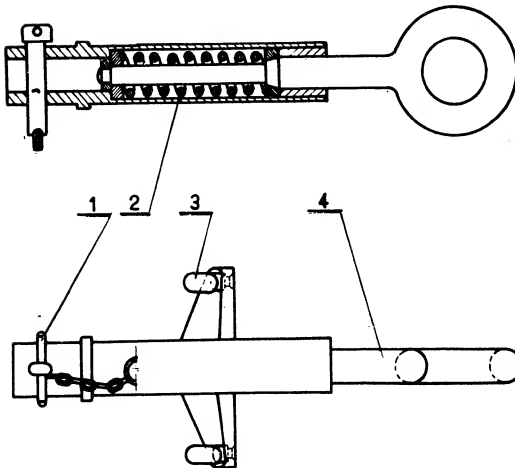


Fig. 49b — LUNETTE — 76 mm
MOUNTAIN GUN M 48 B-1A1 - I

- 1 — Lunette fixing bolt to trails connector
- 2 — Spring
- 3 — Trails fixing bolts
- 4 — Eye



REMARK : When adding fluid special attention should be given not to add more than prescribed. In case more than the prescribed quantity of fluid is added, owing to the impact of the floating piston the middle cylinder shall be damaged, i.e. its bulkhead driven out. Therefore after filling the quantity of fluid required to separate the floating piston from the regulator shaft, the balance of 140 grams of fluid serving as reserve must be accurately weighed.

When adding or taking out of a determined quantity of fluid, after the performed work the pressure should be brought to 62 atm; to do this proceed as follows :

- unscrew the plug screw for the seating of the threeway tube,
- screw in the conducting tube with the compressed azote bottle and bring the pressure in the recuperator to its standard,
- screw in the valve,
- remove the threeway tube with the pressure gauge,
- screw in the plug into the seat of the three-way tube of the valve box.

2 - Filling the recoil brake

a - Complete filling

The hydraulic recoil brake is filled with 1.2 kg of glycerine fluid "Steol".

The filling of the recoil brake is performed only after the recuperator has been adjusted, checked and found in correct condition.

To fill the recoil brake with fluid correctly it is necessary to :

- 1 - Give the cradle an elevation of 45°
- 2 - Remove the protecting box from the cradle
- 3 - Unscrew the valve marked "T" on the middle cylinder
- 4 - Remove the two nuts locking the counter piston rod by means of a wrench
- 5 - Remove the ring with the toothed rack

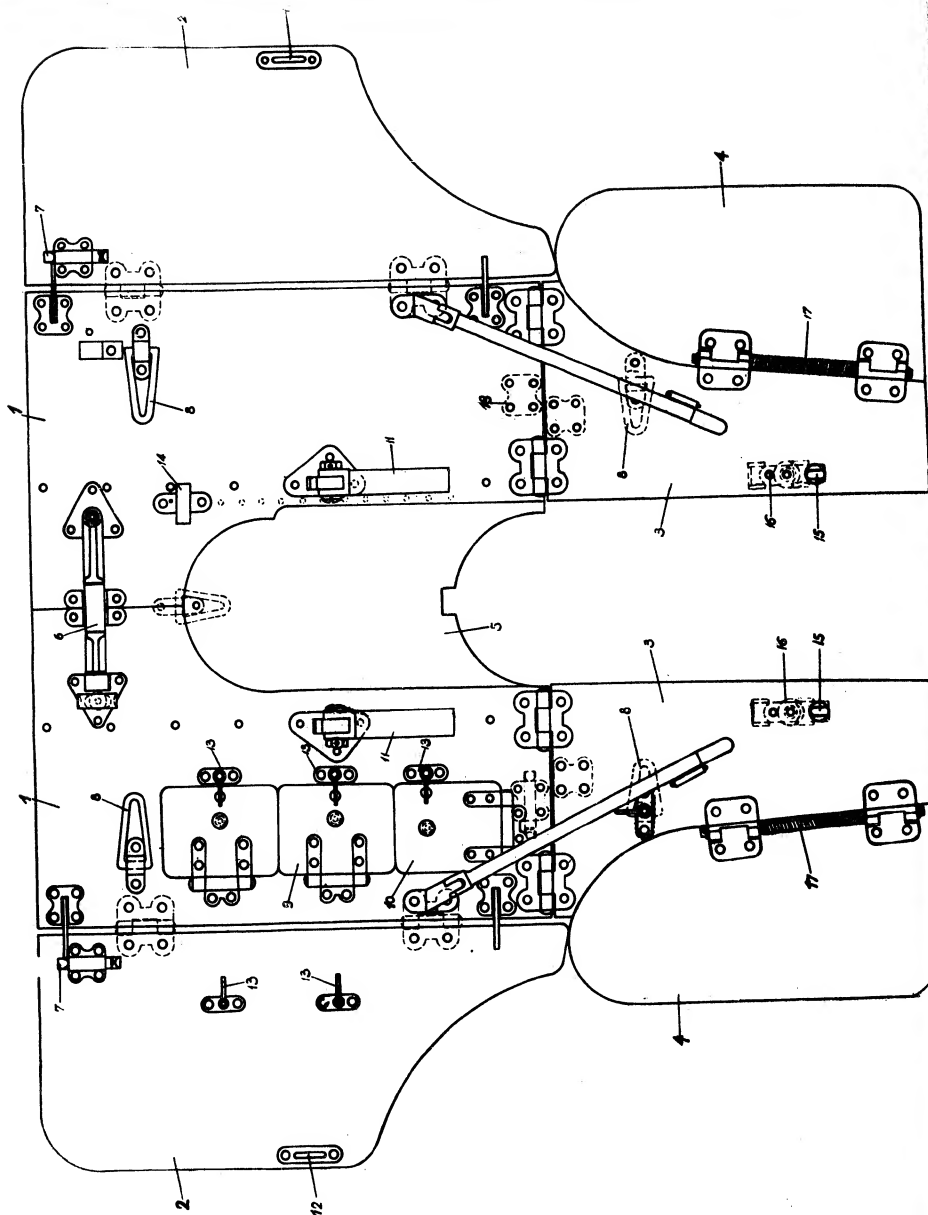


Fig. 50 — SHIELDS

- | | |
|--------------------------------------|--|
| 1 — Left and right shield | 9 — Telescope window (to open when sighting) |
| 2 — Left and right upper wing shield | 11 — Shield brace |
| 3 — Left and right lower shield | 12 — Eye |
| 4 — Left and right lower wing shield | 13 — Lock |
| 5 — Plate between shields | 14 — Latch |
| 6 — Shield strap | 15 — Holes for shield bracket |
| 7 — Side fixing latch | 16 — Fixing bolt |
| 8 — Eye for attaching on pack saddle | 17 — Spring |

- 6 - Loosen by means of a socket wrench the stuffing box of the right cylinder by turning it to the left but not removing it
- 7 - Pull upwards the stuffing box together with the counter piston rod for 5-6 cm, and the recoil brake piston rod downwards for 12 cm.
- 8 - Place the funnel with a sieve into the recoil brake cylinder
- 9 - Pour 1,2 kg of glycerine fluid "steol" MM into the brake cylinder
- 10- Lower the counter piston rod with the stuffing box, lift and lower the counter piston rod several times in order that the fluid may fill up the inner space of the piston rod
- 11- Screw in the stuffing box thus bringing about a pressure in the fluid to make it fill up all the clearances.
- N O T E : If the fluid has been poured in correctly, it should appear on the openings of the seat of the valve marked "T".
- 12- Fix the body of the valve marked "T"
- 13- Bring the cradle into horizontal position and prove the position by putting the quadrant on the slides
- 14- Install the ring with the toothed rack to face the marks on the counter-piston rod
- 15- Install the lock nuts on the counter piston rod
- 16- Reinstall the protecting box on the cradle
- 17- After installing the barrel, prove from the bottom side of the cradle whether the 4 threads of the compensator spring can be seen, what means that the recoil brake is full and contains the required quantity of reserve fluid /50 ccm/.

b - Re-filling with fluid

/Fig. 60/

- 1 - Give the cradle an elevation of 45° and remove the cover from the bottom side of the cradle and prove how many compensator spring threads can be seen. If less than 4 threads are seen, do the following :

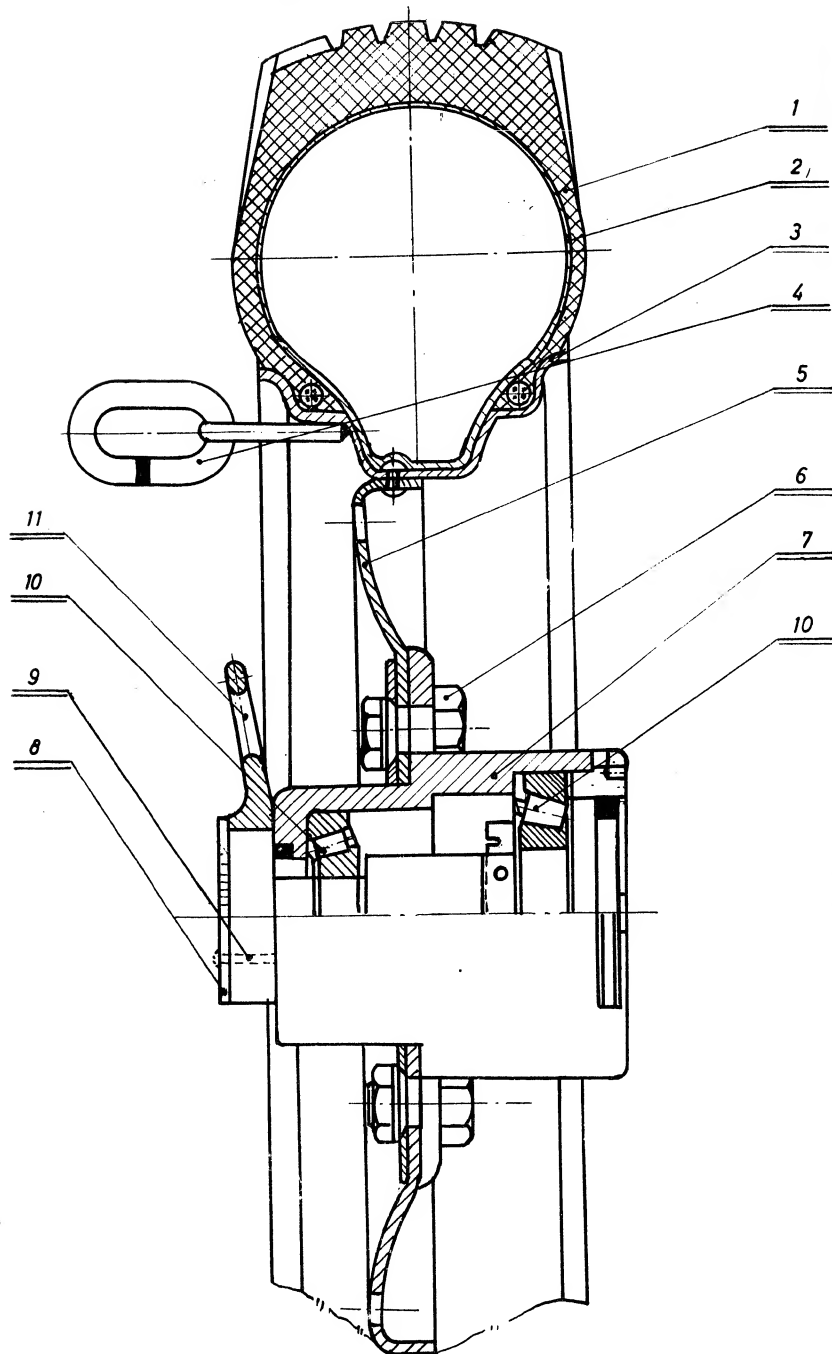


Fig. 51a — WHEEL GUN B-1

- | | |
|-----------------------|----------------------|
| 1 — Rubber tyre | 7 — Hub |
| 2 — Tube | 8 — Hub cover |
| 3 — Rim | 9 — Fastener |
| 4 — Pack loading link | 10 — Roller bearings |
| 5 — Disc | 11 — Towing cyclet |
| 6 — Hub screws | |

- 2 - Remove the protecting box of the cradle
- 3 - By means of a wrench unscrew the plug of the valve marked "T" and loosen for four turns the valve marked "V" to permit the azote to escape
- 4 - Screw the pump, filled previously with fluid, in the hole out of which the plug of the valve marked "T" has been removed. Add fluid until the compensator spring has not been compressed as much as to allow to see the 4 threads through the opening on the bottom side of the cradle
- 5 - When the fluid begins to flow out, tighten the valve marked "V" out of which has earlier the azote been coming out, and continue filling
- 6 - Screw off the pump and tighten the plug of the valve marked "T", through which the fluid was forced in
- 7 - Reinstall the protecting box

When filling the recoil-cylinder, the recuperator should be in order.

B. THE TOP CARRIAGE BODY

/Fig. 43/

The top carriage body is cast or welded steel plate construction. It consists of the base and two sides.

a/ The traversing mechanism

/Fig. 41 and 42/

The traversing mechanism is of the arc-shaped rack type. The mechanism is attached with one part to the left side of the top carriage and with the other one to the bottom carriage.

It consists of :

- the hand wheel with the handle
- the double joint shaft with a bevel gear
- the worm gear shaft and the bevel gear
- two ball bearings, and
- the arc-toothed rack.

The elevating mechanism permits firing with an especially low depression of - 15°.

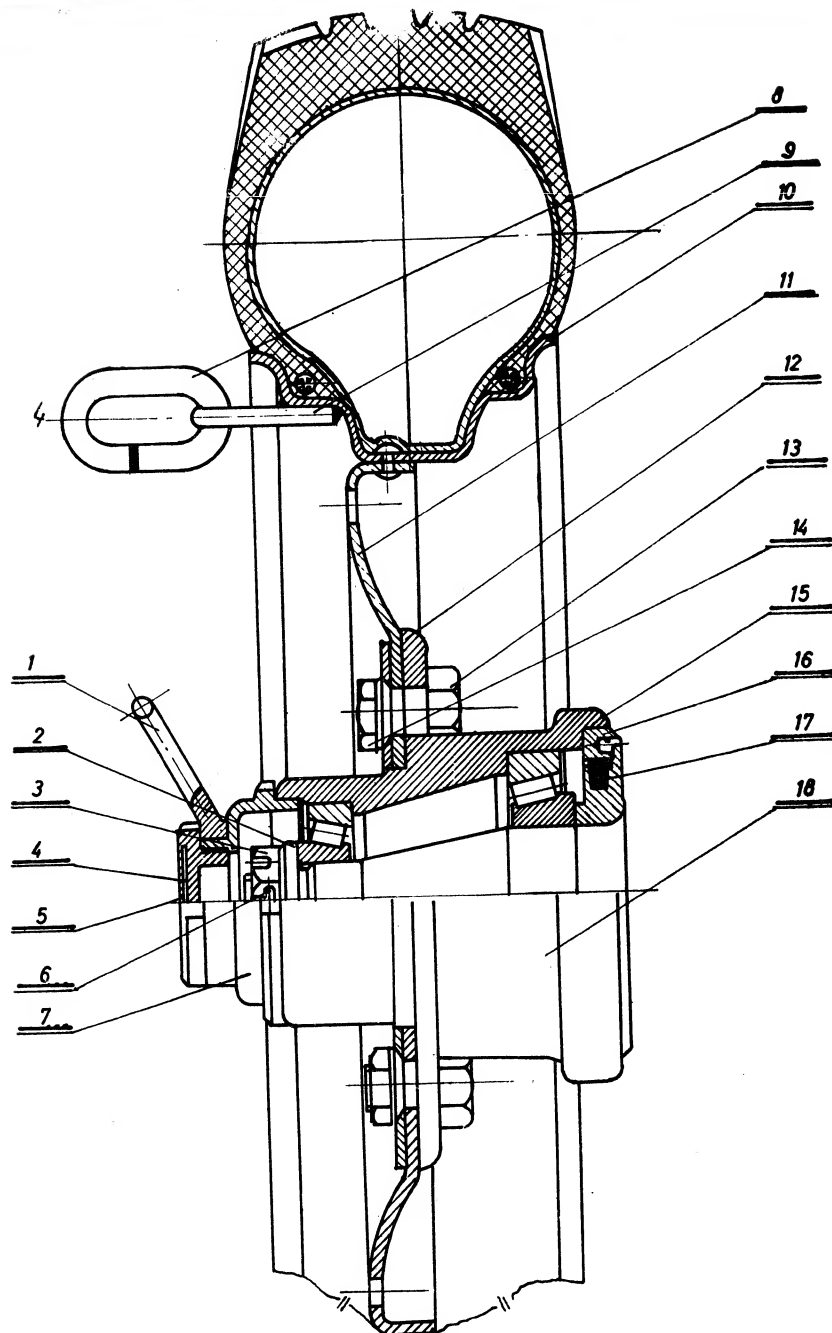


Fig. 51b - WHEEL GUN B-1 A1-I

- | | |
|--------------------------|------------------------|
| 1 - Towing lunette | 10 - Rim |
| 2 - Ball bearing | 11 - Disc |
| 3 - Nut | 12 - Hub |
| 4 - Cover safety element | 13 - Hub screw |
| 5 - Cover | 14 - Nut |
| 6 - Cotter pin | 15 - Roller bearing |
| 7 - Lunette support | 16 - Ring |
| 8 - Pack loading link | 17 - Felt ring |
| 9 - Fastener | 18 - Felt ring support |

Periodically the firmness of the connecting mechanism with the top carriage should be checked especially if play in the traversing mechanism is noticed. If necessary the nuts on the top carriage should be tightened.

On each side of the carriage is a plug for fixing the shields supports.

b/ The elevating mechanism

/Fig. 38, 38b, 39a and 39b/

The elevating mechanism is of the arc-shaped rack type. With one end the mechanism is attached to the outer surface of the left side of the top carriage body, and with the other one to the bottom side of the cradle.

It consists of :

- the hand wheel with the handle
- the bevel gear
- the triple joint shaft with the spring
- the worm gear
- the shaft with two pinions, and
- two arc-shaped racks.

The elevating mechanism permits firing with an especially low depression of -15° .

c/ The Equilibrators

/Fig. 40a and 40b/

The equilibrators are of the spring pulling type, because of their pulling down the rear part of the cradle in elevation.

There are two equilibrators - a left one and a right one.

The equilibrators consist of :

- an outer tube, being cast together with the top carriage base
- an inner tube
- a spring
- a steel wire cable
- a ball bearing
- a pulley

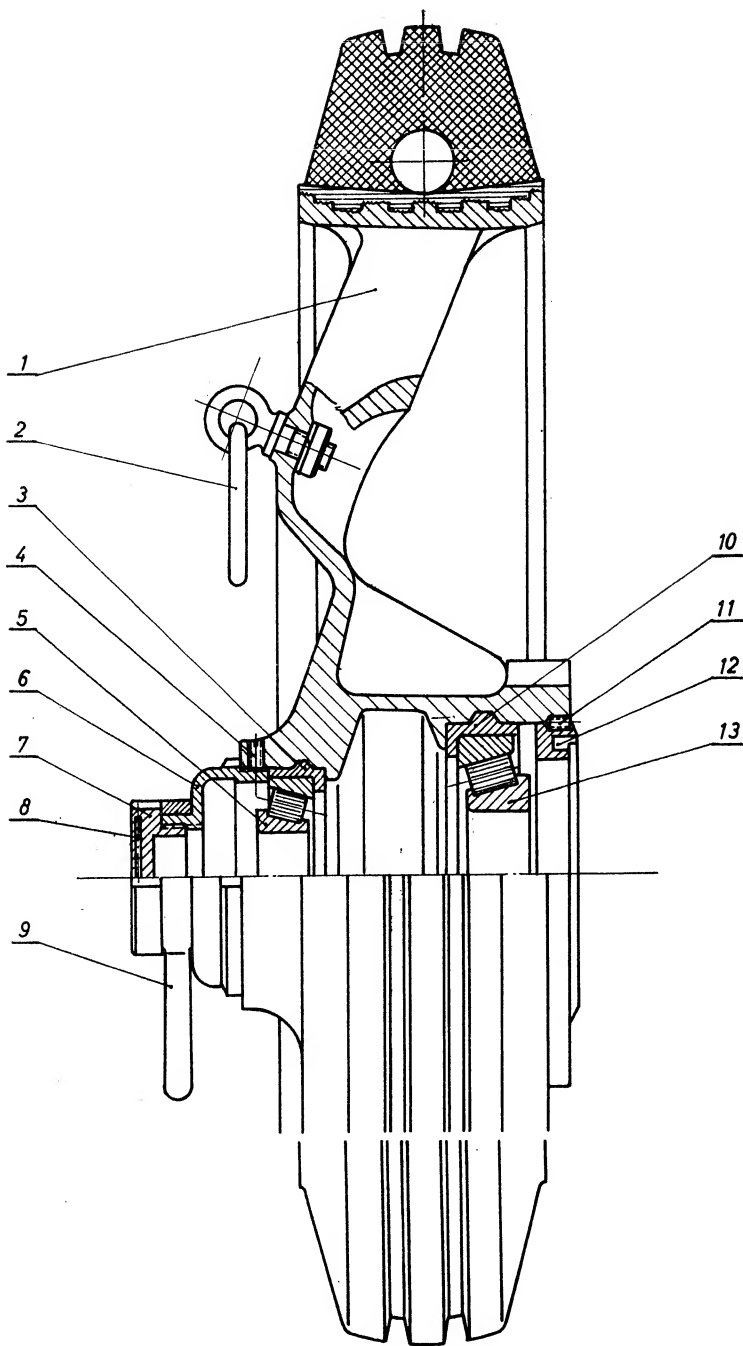


Fig. 51c — WHEEL GUN B-1 A-2

- | | |
|----------------------------|---------------------------|
| 1 — Wheel body | 8 — Spring safety element |
| 2 — Pack loading link | 9 — Towing lug |
| 3 — Steel bushing | 10 — Steel bushing |
| 4 — Hub cap safety screw | 11 — Fastening screw |
| 5 — Roller bearing — small | 12 — Bronze ring |
| 6 — Hub cap | 13 — Roller bearing — big |
| 7 — Cap cover | |

- a fixing key, and
- a safety lug.

Assembling of the equilibrators is performed by means of special accessories only which are provided in the battery set of spares, tools and accessories, in the manner as described for disassembling.

Locking of the equilibrators

Prior to disassembling the barrel and removing it from the cradle it is obligatory to lock the equilibrators.

To perform correctly this operation, the cradle should be slightly depressed so that the inner tube may enter into the outer tube as much that the seats for the locking pins of the equilibrators are free.

When the inner tube retracts, the pin is put into its seat in the outer tube and by means of the elevating mechanism the barrel is elevated so much that the connecting shackle of the steel cable can be removed from the hook on the cradle trunnion and hooked to the spring on the inner side of the carriage body. During the elevation of the barrel, one man lifts the front end of the cradle.

The unlocking of the equilibrators is done in reverse order.

When connecting the equilibrators attention should be given to proper placement of the steel wire cable into the pulley groove. If the steel wire cable gets in between the recess on the carriage and the pulley, and that in this case the elevating mechanism is being operated, the steel cable of the equilibrators will get damaged. The cause for steel wire cable defects and breaking in most cases is the carelessness mounting and therefore to this special attention should be given. As soon as any broken wires are noticed on the steel wire cable of the equilibrators, it should be replaced with a new one. The steel wire cable should be inspected perio-

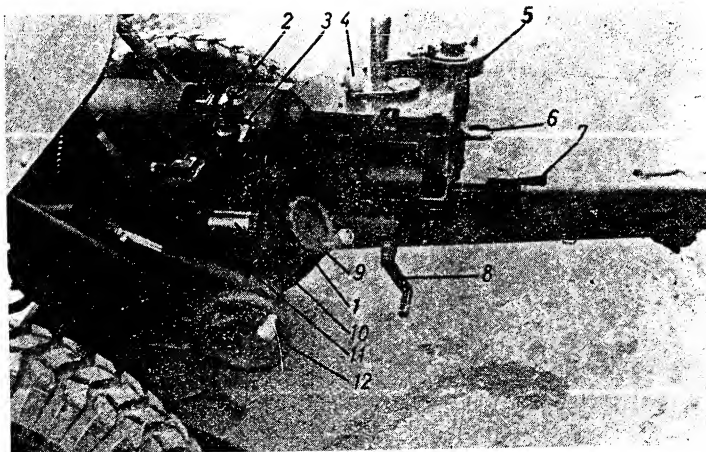


Fig. 52 — LEFT SIDE VIEW OF THE GUN

- | | |
|--------------------------------|----------------------------|
| 1 — Azimuth scale | 8 — Auxiliary trigger |
| 2 — Elevation micrometer | 9 — Traversing hand wheel |
| 3 — Micrometer | 10 — Range drum |
| 4 — Recocking handle | 11 — Range scale |
| 5 — Semiautomatic circular box | 12 — Elevating handwheel |
| 6 — Lifting eye | 13 — Cross level mechanism |
| 7 — Operating cam | 14 — Angle of site scale |

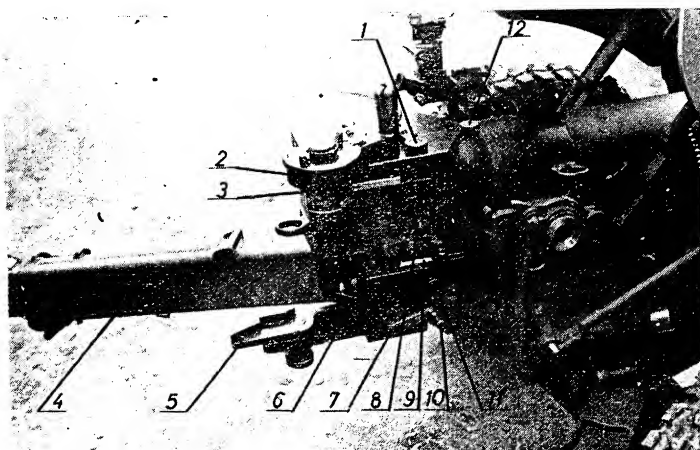


Fig. 53 — RIGHT SIDE OF THE GUN

- | | |
|--------------------------------|-----------------------------------|
| 1 — Extractor shaft | 6 — Semiautomatic shaft |
| 2 — Semiautomatic circular box | 7 — Auxiliary trigger detent |
| 3 — Guide | 11 — Operating cam fastening bolt |
| 4 — Trail attaching latch | 12 — Leveling plate |
| 5 — Operating cam | |

ically for corrosion. When found to be seriously corroded, the steel wire cable should be replaced. To prevent corrosion the steel wire cable should be greased always.

While working on the equilibrators, nobody should be allowed to stay in front of them.

Disassembling of the equilibrator

/Fig. 61, 62 and 63/

In order to disassemble the equilibrator :

- 1 - Lock the equilibrator and remove the steel cables from the cradle shoulders
- 2 - Remove the shields, the barrel with the breechring, the mantle, the cradle, and the shield supports from the gun
- 3 - Unscrew the protecting roller
- 4 - Remove the equilibrator locking pin
- 5 - Take the device for disassembling the equilibrator
- 6 - Hook the shackle of the steel cable onto the hook of the equilibrator disassembling device screw
- 7 - Screw in the screw of the device until there is so much traction on the inner tube, that the pin may be pulled out
- 8 - Pull out the pin and suspend it onto the outer side of the top carriage body
- 9 - Unscrew the screw until the spring is completely released
- 10- After releasing the spring unhook the shackle of the steel cable from the hook on the device. To do this, one man of the gun crew presses the inner tube and compresses the spring slightly from its front part
- 11- Unscrew the shackle from the steel cable
- 12- Remove the spring from the tube
- 13- Unscrew, with a wrench, the steel cable from the inner tube bottom
- 14- Remove the ball bearing from the inner tube
- 15- Unscrew one screw and the inner tube bottom /this to be performed only by artillery mechanics/.

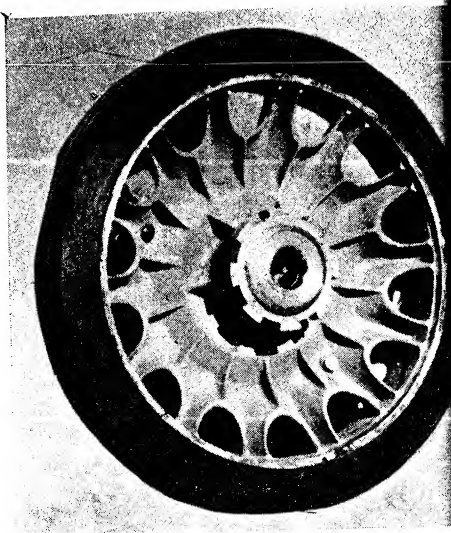
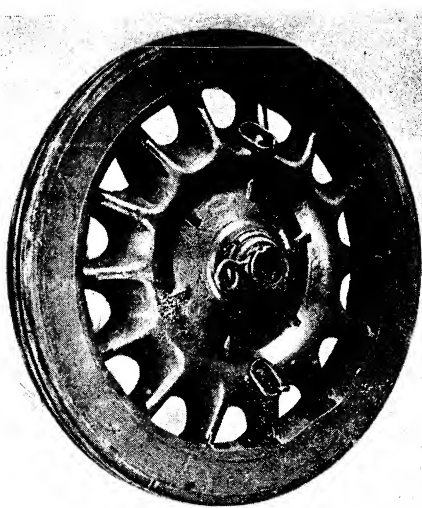


Fig. 51d — THE WHEEL WITH THE SOLID SEMI-ELASTIC
TYRE TYPE B-1A2

1 — External appearance

2 — Interior appearance

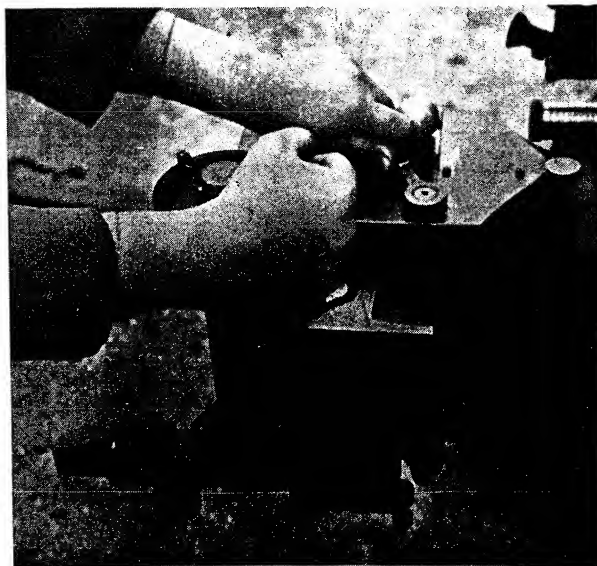


Fig. 54 — OPERATION OF BREECHBLOCK — Closing of the
breechblock when the barrel is not loaded

N O T E : When disassembling the equilibrators, nobody is allowed to stay in front of them, and the operator using the disassembling device should work from the side.

Assembling of the equilibrators is done in reverse order.

Adjusting of the equilibrators

/ Fig. 62/

If the elevating gear does not work easily or it works abruptly, it is necessary to adjust the strength of the equilibrator spring. Prior to adjusting the equilibrator spring it is necessary to remove the locking pin and after the adjustment the safety pin must be reinstalled.

To adjust the equilibrator spring it is necessary to put from the front side one of the wrenches into the square hole and the other one into the openings on the inner tube cover and holding the wrench in the square hole, unscrew or screw in the inner tube until thoroughly adjusted, i.e. until the elevating gear works easily and without jerking.

The nut on the end of the steel cable should be unscrewed from the bottom almost for 40 mm /forty mm/; if it is unscrewed for more than that, there is danger that the thread might be broken and the equilibrator spring might throw out the inner tube.

After completing the adjustment of the equilibrator, the lock should be fastened in order to prevent the steel cable from unscrewing from its nut on the front end.

C. THE BOTTOM CARRIAGE

The bottom carriage is composed of :

- the travelling axle
- the equalizer parts
- the springs
- the wheels, and
- the carriage trails.

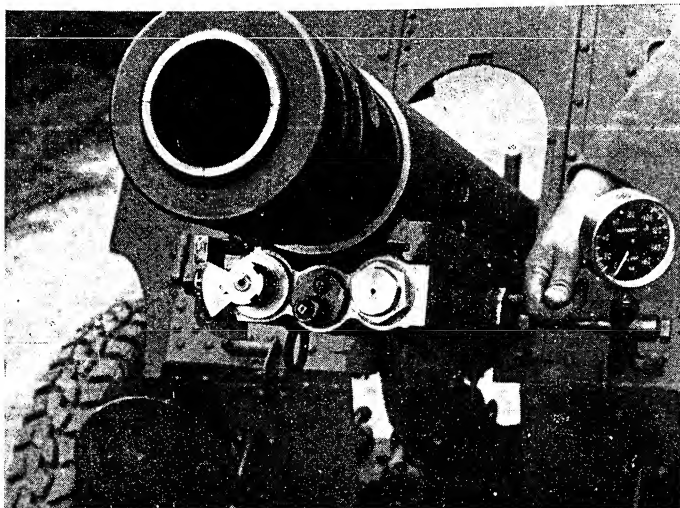


Fig. 55 — CHECKING PRESSURE IN RECOIL MECHANISM



Fig. 56 — RECOUPERATOR
AZOTE FILLING

a/ THE TRAVELLING AXLE

The travelling axle is designed to carry the weight of the gun during travelling and firing. It connects all the parts of the bottom carriage and bears the top carriage.

b/ THE PARTS OF THE EQUALIZER

/Fig. 44a, 44b and 45a/

The equalizer parts are designed to make the trails to bear equally the gun during firing, even then when their spades are not level owing to unlevel ground, and to permit on the march one trail or the other one to rise or to fall according to the terrain, without transmitting this motion to the axle and the gun.

They consists of :

- the equalizer bar
- the left and the right equalizer, and
- the parts fastening the equalizer bar to the travelling axle.

c/ THE SPRING DEVICES

/Fig. 45b and 45c/

The spring devices are spring loaded. They provide an elastic connection for the wheels with the travelling axle, and serve to absorb the shocks of the wheels, transmitting them by straining the snail spring, thus preventing the travelling axle and the other parts of the gun from suffering shocks.

There are two types of spring devices :

- spring device with a spiral spring on weapons 76 mm M-48 B-1,

- spring device with cylindrical coil spring on weapons 76 mm M-48 B-1A2 and 76 mm M-48 B-1A1-I.

The spring device type B-1 with spiral spring /for weapons 76 mm M-48 B-1/

Each spring device consists of :

- the spring housing with cover
- the key, fixing the box to the travelling axle

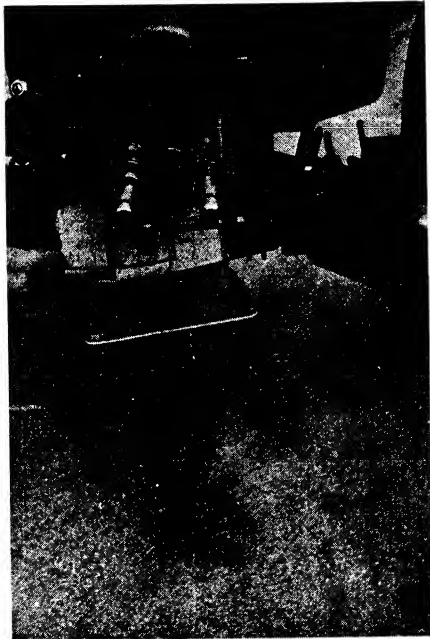


Fig. 57 — RELEASE OF RESERVE OIL FROM RECOIL MECHANISM

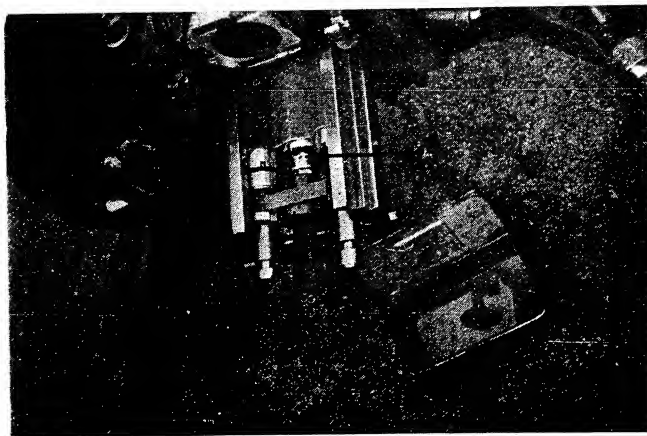


Fig. 58 — REGULATOR PART POSITION WHEN RESERVE OIL RELEASED AND FIRING SHOULD BE INTERRUPTED

- | | |
|---|---|
| 1 — Gap between the stuffing box and the valve head. When the gap reaches 5 mm — STOP THE FIRING! | 2 — Bushing — protecting the oil pump (from the tool-kit) |
| | 3 — Pusher (from the tool-kit) |

- the unlocking bolt
- the spring of the device, and
- the semi-axle with the shoe.

The action of the spring device during travelling

When the wheel in motion runs against a higher spot on the road, the semi-axle together with the wheel lifts, thus turning the spring shaft by means of the lever. The turning of the spring shaft causes the spring to expand /strain/ because of its being attached with one end to the shaft and with the other one to the housing. The straining of the spring smoothes the uneven motions of the wheel, transmitting it to the travelling axle.

When the wheel bumps into a hole on the road, the side of the gun will go down together with the wheel because of its own weight, the entire process being the same as when the wheel runs against a higher spot.

The locking of the spring devices

The spring devices are unlocked when the spring is able to absorb the shocks of the wheels. When the spring devices are unlocked, the locking bolt in the housing gets out of its seat with its top on the semi-axle lever, this being the correct travelling position of the spring.

The spring device are locked when the locking bolt, entering with its top into the semi-axle lever securely connects the semi-axle with the travelling axle by the intermediary of the spring housing.

This is the position of the spring devices in firing and in travelling, in the event that any of the spring devices is broken.

The locking and unlocking of the spring device is done in such a way, that one man of the gun crew presses down with his foot the shoe on the semi-axle, another man of the crew turning with his hand the bolt on the spring housing upwards.

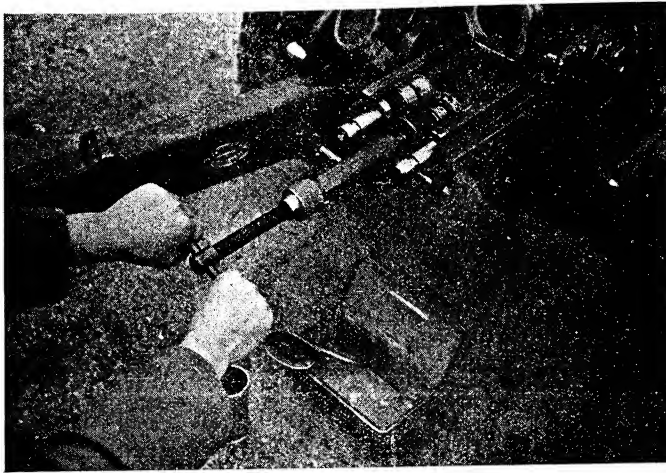


Fig. 59 — RECUPERATOR RESERVE OIL REFILLING

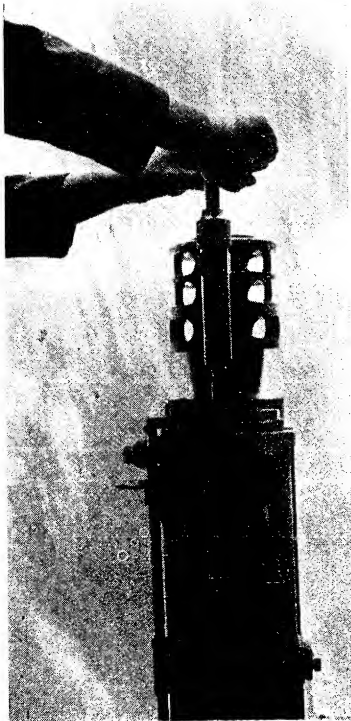


Fig. 60 — RECOIL CYLINDER
RESERVE OIL REFILLING

on the spring housing upwards.

It is obligatory to lock the spring devices before starting firing, otherwise damage would occur.

Disassembling of the spring device housing assembly

The spring devices are not to be disassembled for every day maintenance and training purposes. Disassembling of the spring devices is allowed only on occasion of the replacement of unserviceable parts.

To disassemble the spring device housing :

- 1 - Put a wooden block under the axle and lift that wheel whose component parts are to be disassembled
- 2 - Turn the locking wing to the rear
- 3 - Remove the wheel from the axle
- 4 - Remove the spring device housing, for which purpose :
 - pull out the cotter pin from the nut on the spring shaft
 - unscrew the nut and remove the washer
 - disconnect the spring box from the semi-axle
- 5 - To remove the spring shaft :
 - unscrew the set screw
 - by means of a socket wrench unscrew the nut, attaching the shaft to the box
 - by means of a scissors wrench unscrew the housing cover
 - remove the shaft.
- 6 - Remove the device spring by knocking out from the opposite side of the box the spring by means of a drift pin, on that spot of the opening which is sealed with lead.
- 7 - Remove the fixing key of the spring housing from the semi-axle, by :
 - removing the cotter pin from the nut on the key
 - unscrewing the nut
 - removing the spring washer
 - pulling out the key upwards.



Fig. 61 — REMOVING
TUBE SAFETY LOCK
BEFORE ADJUSTING
THE EQUILIBRATOR

Fig. 62 — EQUILIBRATOR
SPRING ADJUSTING

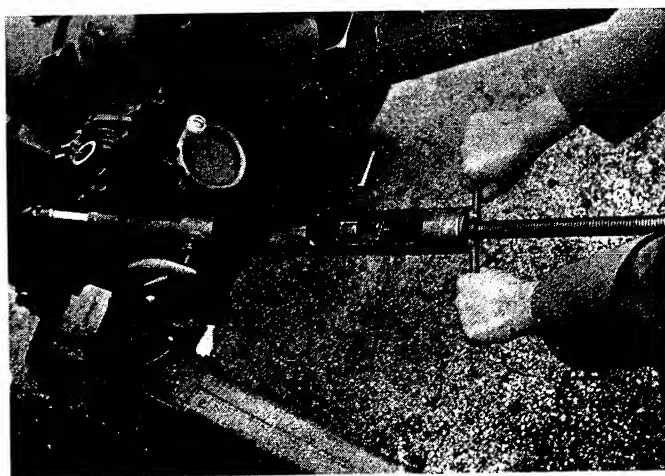
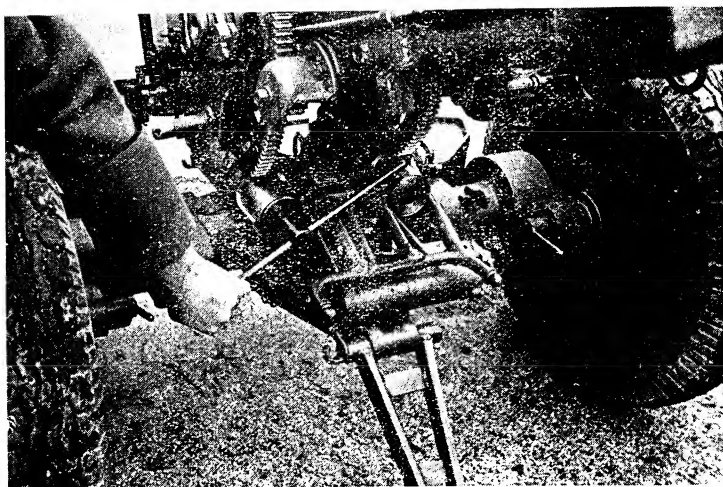


Fig. 63 — EQUILIBRATOR
SPRING REMOVING

- 8 - Remove the spring locking key, after having unscrewed its stop screw.
- 9 - Remove the semi-axle from the wheel, by :
 - removing the set screw from the wheel retainer on the semi-axle /From the outer side of the wheel/
 - unscrew, by means of a scissors wrench, the wheel retainer from the semi-axle
 - lay the wheel on its outer side, remove the brass ring retainer and with a scissors wrench unscrew the brass ring, striking from time to time with a wooden hammer the semi-axle from the opposite side
- 10- Remove the smaller ring with the roller bearing, by striking slightly with a copper hammer to make it fall off the axle.
- 11- Remove the larger ring with the roller bearing by :
 - unscrewing the set screw from the inner ring
 - unscrewing the inner ring with a scissors wrench.
- 12- Remove the spring lock by :
 - unscrewing the screw, and
 - lifting out the bolt with the spring.
- 13- Unscrew the attaching screw and remove the rubber pad.

The assembling of the spring devices

The assembling of the spring devices is done in the reverse order in relation to disassembling. The parts marked "D" should be placee on the right side and the parts marked "L" on the left side.

Locking of the spring devices for pack-saddle transport

When the wheel is packed on the pack-saddle, its spring devices remain on the wheel. In order to prevent the spring from jerking during the march, the spring devices should be locked. The locking of the wheel spring device is done by turning the spring housing so that the spring lock faces the hole on the hub rim, after which the lock handle is pulled towards the wheel.

The spring device type B-1A2 with a cylindrical coil spring /fig.

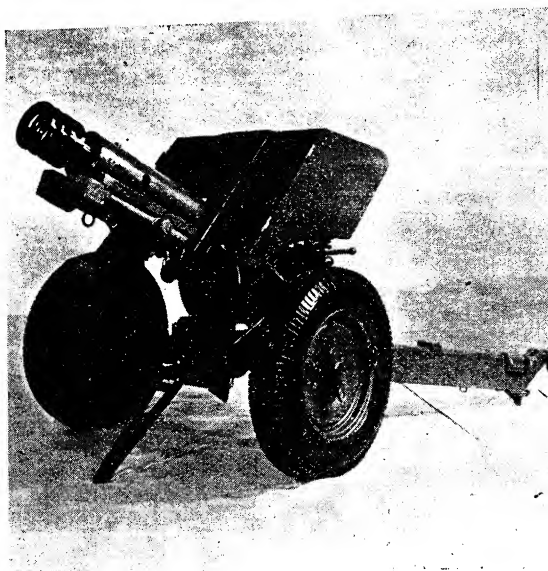


Fig. 64 — GUN IN FIRING POSITION WITHOUT REAR TRAILS — The firing in this position should be considered in exceptional cases only and may be done with charge 1, 2 and 3

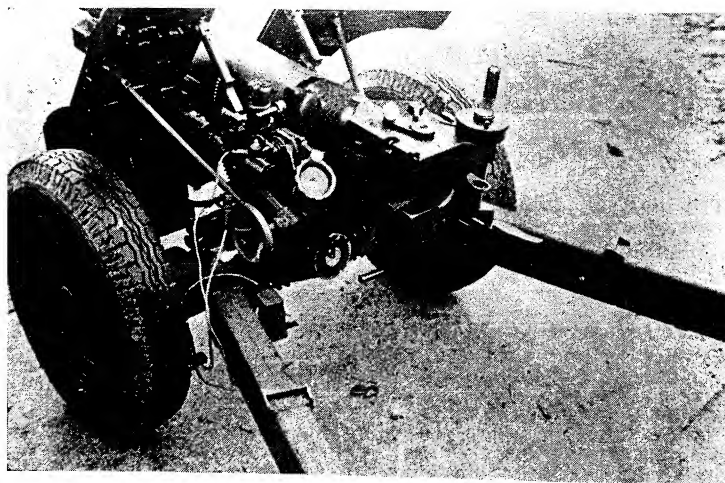


Fig. 65 — GUN WITH INSTRUMENT LIGHT FOR SIGHTING

cylindrical coil spring /fig. 45c, 45d and 45e/ /for weapons 76 mm M-48 B-1A2 and 76 mm M-48 B-1A1-I/.

The spring device with its horizontally coiled spring is of cylindrical shape and consists of :

- spring device casing assembly /21/
- spring /11/
- spring device axle /13/
- spring device lever /14/
- front cover assembly /4/
- rear cover assembly /17/
- wheel axle assembly /33/

a/ Spring device casing assembly /21/ includes all the parts of spring and forms the connection of the spring with the wheel and is provided with a lock for a connection with the axle part on the piece /20/.

The casing body is made of forged steel, its shape is cylindrical and it is provided with a cross reinforcement and openings for passage of one end of the axle. The axle passage openings are fitted with bronze bushings. Each bronze bushing is secured by means of screw to prevent it from turning.

On one end the casing is provided with a projection serving for connection with the axle on the piece and on its other end it is provided with a bearing of the spring device disconnecter.

The projection for connection with the piece axle is provided with a conical hollowness which, in shape, is similar to the end of the piece axle which is identical to the one on the Gun B-1 and therefore enabling the exchange of wheels with springs on the Gun B-1 from the Gun B1-A2.

The disconnecter of the spring device serves to create a rigid connection of the wheel with the travelling axle during firing.

Disconnecting of the spring device is done by pushing the spring bolt in the extreme position of its seating so that with its one portion it enters into the

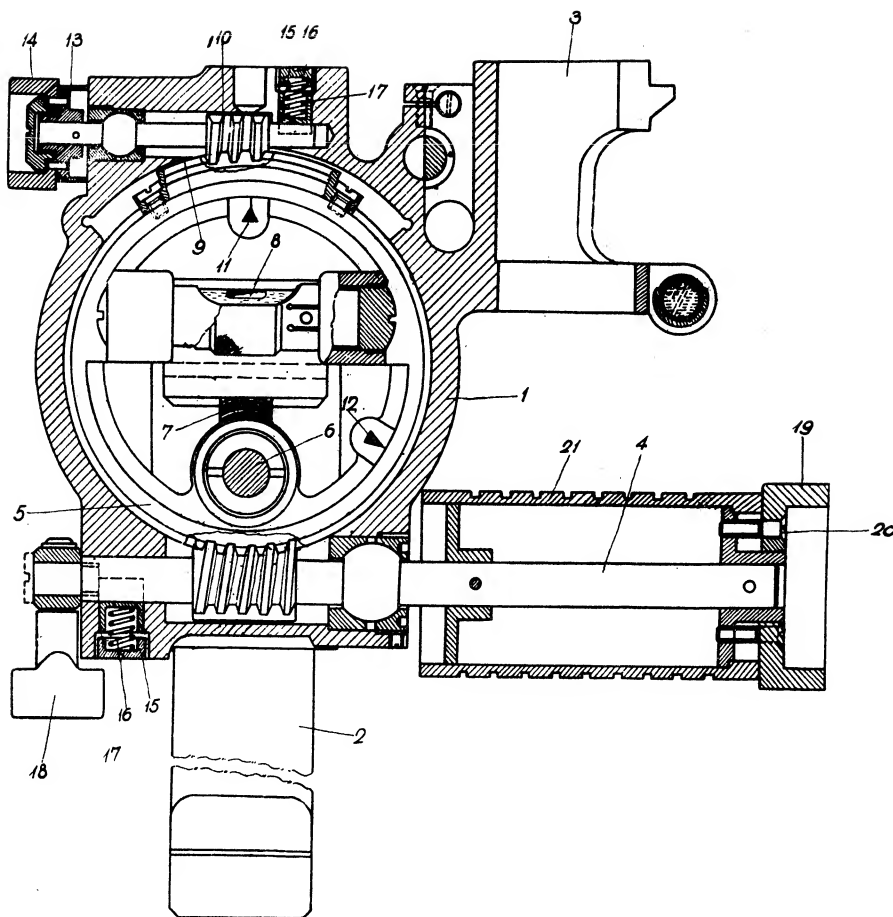


Fig. 66a — RANGE QUADRANT

- | | |
|--|-------------------------------------|
| 1 — Casing | 11 — Angle of site index |
| 2 — Support | 12 — Range drum index |
| 3 — Panoramic telescope mount | 13 — Angle of site micrometer scale |
| 4 — Spindle | 14 — Angle of site knob |
| 5 — Inner ring | 15 — Follower |
| 6 — Cross level spindle | 16 — Spring |
| 7 — Cross level worm rack | 17 — Bushing for adjusting the fit |
| 8 — Longitudinal level | 18 — Range spindle lock |
| 9 — Outer ring | 19 — Range knob |
| 10 — Spindle with worm for angle of site setting | 20 — Range drum, set screw |
| | 21 — Range drum |

corresponding recess on the axle end, and the semi-round safety element snaps into the seating on the bolt.

The disconnecter has two positions indicating whether the spring is connected or disconnected.

The connection of the spring device casing with the travelling axle is achieved by means of a lock consisting of :

- rotating bolt /20/
- spring washer /28/
- nut /27/
- pin /26/

On its upper end the rotating bolt is provided with a dent catch to prevent it from turning during the travel. The bolt body is semi-circularly cut as to enable adjusting the spring device to the travelling axle.

The casing body is provided with two grease cups for lubrication of bronze bushings.

b/ The spring /11/. The spring is cylindrical-coil shaped and serves to create an elastical connection of the wheel to the travelling axle.

With its one end the spring rests on the front cover assembly and with its other end bears on the spring device axle projection. The tension of the spring may be adjusted by screwing or unscrewing of the front cover.

c/ The spring device axle /13/. The axle serves for connecting and guiding of the spring and for creating the joint connection together with the spring device lever.

With its front end the axle passes through the bronze ball bearing /7/ enabling axial and radial movement of the axle. On its rear portion the axle is provided with two swellings, the first one serves for guiding and the other for resting of the spring.

d/ The spring device lever /14/. This lever creates the connection between the spring device axle and the wheel axle. The lever is provided with an



Fig. 66c — PANORAMIC TELESCOPE

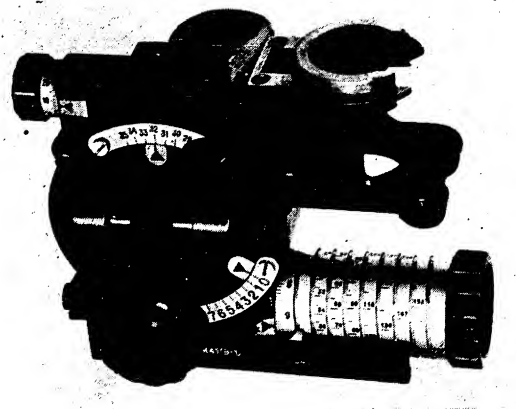


Fig. 66b — RANGE QUADRANT

66

indented seating for the passage of one end of the wheel axle in order to create, in this manner, a firm connection and to enable the transmission of wheel axle movement to the lever and from the lever to the axle which with its movement compresses or releases the spring.

e/ The front cover assembly. This assembly consists of :

- nut /4/
- bronze bearing
- ball joint
- bearing plate
- felt wiper

f/ The rear cover assembly. This assembly consists of :

- nut /15/
- rubber buffer /16/
- safety screw /9/

g/ The wheel axle assembly. This assembly consists of :

- elbow shaped axle /33/
- washer /24/
- nut /22/
- cotter pin /23/
- ring with a felt wiper /31,32/

On the end of the axle portion on which the wheel is placed are :

- washer
- nut /35/
- cotter pin /23/

1. The functioning of the spring device

The role of the spring device is to ease shocks during movement of the gun over rough ground.

During movement of the gun, when the wheel meets an obstacle, the wheel raises and turns the lever at a certain angle and the wheel axle, over the lever, passes on the spring device axle, which in turn compresses the spring and in this manner the shock on the



Fig. 66c — PANORAMIC TELESCOPE

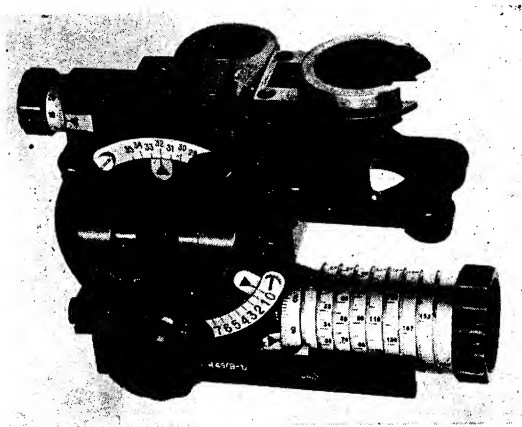


Fig. 66b — RANGE QUADRANT

indented seating for the passage of one end of the wheel axle in order to create, in this manner, a firm connection and to enable the transmission of wheel axle movement to the lever and from the lever to the axle which with its movement compresses or releases the spring.

e/ The front cover assembly. This assembly consists of :

- nut /4/
- bronze bearing
- ball joint
- bearing plate
- felt wiper

f/ The rear cover assembly. This assembly consists of :

- nut /17/
- rubber buffer /16/
- safety screw /9/

g/ The wheel axle assembly. This assembly consists of :

- elbow shaped axle /33/
- washer /24/
- nut /22/
- cotter pin /23/
- ring with a felt wiper /31, 32/

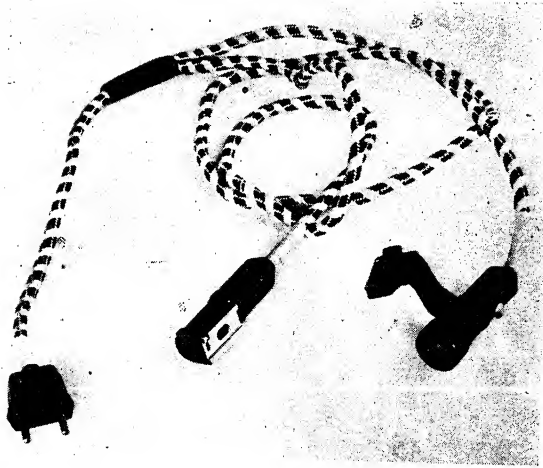
On the end of the axle portion on which the wheel is placed are :

- washer
- nut /35/
- cotter pin /23/

1. The functioning of the spring device

The role of the spring device is to ease shocks during movement of the gun over rough ground.

During movement of the gun, when the wheel crosses an obstacle, the wheel raises and turns the lever at a certain angle and the wheel axle, over the lever, passes on the spring device axle, which in turn compresses the spring and in this manner the shock on the



INSTRUMENT LIGHT

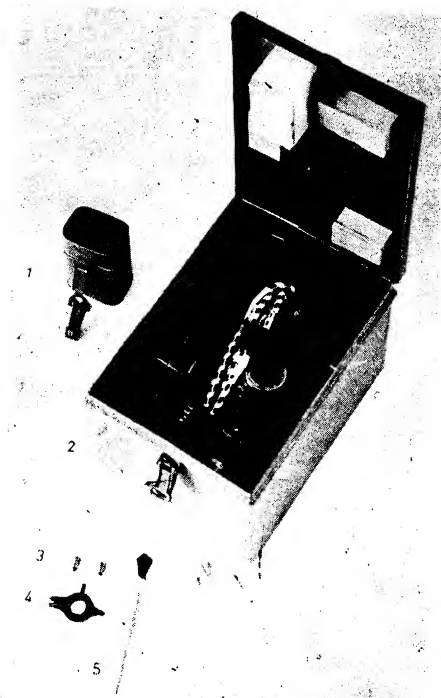


Fig. 67 — SIGHTING EQUIPMENT CHEST

wheel is being used up on compressing of the spring.

Being that the lever moves in an arc, it raises the axle to a certain extent. Movement of the axle is made possible by means of the joint connection with the lever and the spherical seating in the front cover of the spring device.

The movement of the axle is not limited and therefore by abnormally great shocks greater compression of the spring occurs.

When the wheel hits sunken ground the spring expands and pushes the lever which in turn transmits the movement to the axle and in this manner maintains a uniform contact of the wheel with the ground.

When the wheel hits big holes in the ground, during its backward movement the lever strikes against a rubber buffer which absorbs the shock of the wheel itself during descending into the hole.

2. Fixing the wheel and the spring device to the travelling axle

To fix the wheel and the spring device to the travelling axle proceed as follows :

- check to see that bolt wing is turned facing the travelling axle,
- pull the spring device on the travelling axle as far as it will go and turn the bolt for 90° .

To prevent the bolt from turning and the wheel from falling off during travel, the bolt is provided with a dent which snaps into a corresponding seating on the casing and is being constantly held in that position by the pressure of the spring.

Removing of the wheel and the spring device is achieved by raising the bolt high enough for its dent to leave its seating and then by turning the bolt wing for 90° toward the travelling axle and the wheel and the spring device is free to be removed.

3. Connecting and disconnecting of the spring

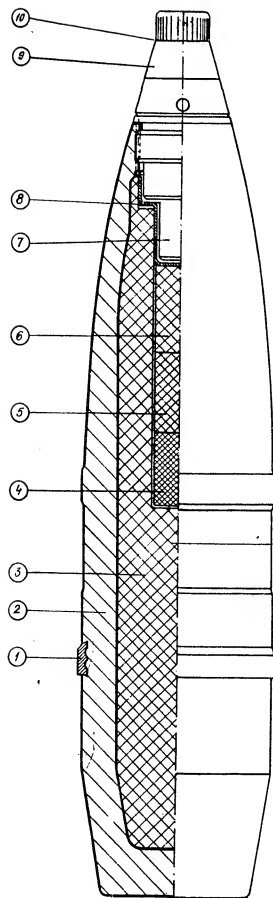


Fig. 68 — HIGH EXPLOSIVE SHELL »HE-OF-350«

- | | |
|--|---------------------------------------|
| 1 — Rotating band | 6 — Three part booster (lower charge) |
| 2 — Shell body | 7 — Booster cavity |
| 3 — Bursting charge | 8 — Washer |
| 4 — Three part booster (upper, charge) | 9 — Plug |
| 5 — Three part booster (intermediate charge) | 10 — Gasket |

During travel the spring devices should be connected and prior to firing it is obligatory to disconnect them.

To disconnect the spring devices, proceed as follows :

- with one hand take to the muzzle brake
- and with the other hand to the disconnect-or bolt handle, push the bolt and at the same time move the tube until recess on the axle comes in line with the bolt.

To connect the spring device, reverse the above procedure, taking care that the bolt is withdrawn from recess far enough to allow the semiround safety element to fall into its seating in order to prevent free movement of the bolt during travel.

4. Loading of the wheel and the spring device

For loading on the pack-saddle, the wheel and the spring device are provided with lugs for hanging on the hooks of the pack-saddle. To prevent swinging of the spring device during travel, it is necessary to strap the disconnecting bolt to the pack-saddle.

5. Spring device adjusting

For adjustment, the wheel and spring device should be removed from the gun because in this state the spring is completely released and its adjustment is much easier.

The strength of the spring may be adjusted by screwing or unscrewing of the front cover two complete revolutions maximum. Should the spring get too weak, it is recommended to insert into the front cover a steel washer up to 2 mm thickness.

Normally the spring should be compressed so much that in free state, when not mounted on the gun, it keeps the lever pressed against the rubber buffer. In this position the front cover is completely screwed into the casing.

6. Replacement of the spring

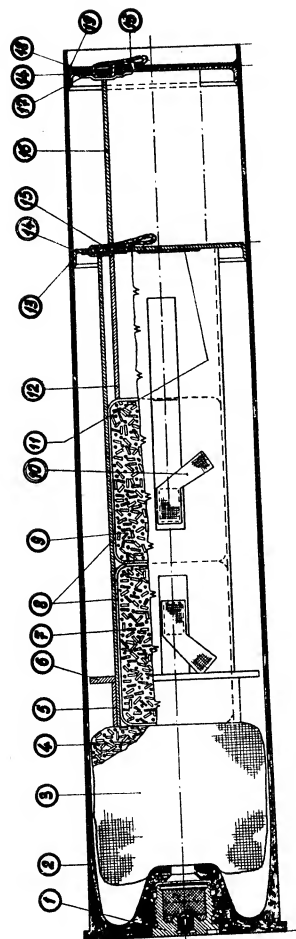


Fig. 69 CARTRIDGE CASE WITH PROPELLING CHARGE FOR
HIGH EXPLOSIVE SHELL

- | | |
|-----------------------|---------------------|
| 1 — Percussion primer | 10 — Strip |
| 2 — Cartridge case | 11 — Wad |
| 3 — Ignition charge | 12 — Cartouche |
| 4 — Powder grains | 13 — Wad |
| 5 — Cartouche | 14 — Strip |
| 6 — Paper ring | 15 — Strip |
| 7 — Powder grains | 17 — Wad |
| 8 — Bags | 18 — Cartridge case |
| 9 — Powder grains | 19 — Sealing |

6. Replacement of the spring

To replace spring, proceed as follows :

- remove the wheel and the spring device from the travelling axle,
- unscrew the front cover and remove it from the axle,
- take out the broken or the weakened spring,
- put in a new spring,
- place the front cover on the axle and screw in to the end.

7. Replacement of the rubber buffer

To replace a worn rubber buffer, proceed as follows :

- unscrew the safety element of the rear cover from the casing,
- unscrew the rear cover, and
- remove the worn out rubber buffer and replace it with a new one.

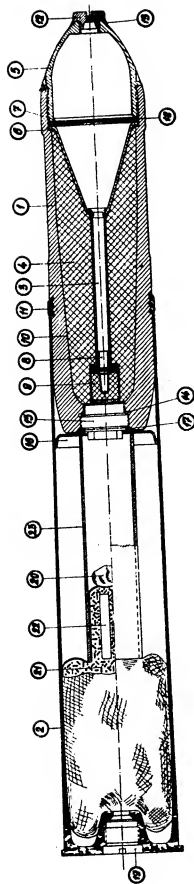
8. Spring device maintenance

To keep the spring device in proper functioning condition, special attention should be given to lubrication. Prior to every move of the unit and also during long travels, grease should be forced into the grease cups, in the spring device casing, until you notice that the grease shows on the edges of the bronze bearings. Furthermore, periodically it is necessary to fill up the front cover with lubricant to keep the ball bearing and the lever ball joint and the axle greased.

The spring should be always coated with grease and periodically also the disconnecting bolt and the recess on the elbow shaped axle ought to be lubricated.

D. THE WHEELS /Fig. 51a, 51b, 51c and 51d/

- The weapon 76 mm M-48 B-1 is equipped with wheels having pneumatic tyres and spring devices with spiral springs /figure 51a/.
- The weapon 76 mm M-48 B-1A1-I is



- 1 — Shell body
- 2 — Cartridge case
- 3 — Tube
- 4 — Bursting charge
- 5 — Ballistic cap
- 6 — Gasket
- 7 — Gasket
- 8 — Ring
- 9 — Booster
- 10 — Shell body
- 11 — Rotating hand
- 12 — Closing plug
- 13 — Gasket
- 14 — Washer
- 15 — Plug
- 16 — Wad
- 17 — Gasket
- 18 — Ring
- 19 — Percussion primer
- 20 — Bag
- 21 — Powder grains
- 22 — Cut-out
- 23 — Cartouche

Fig. 70 — ROUND WITH HIGH EXPLOSIVE, ANTITANK SHELL

70

- The weapon 76 mm M-48 B-1A1-I is equipped with wheels having pneumatic tyres and spring devices with cylindrical coil springs /fig. 51b/. These wheels differ from B-1 type wheels only in their simplified manner of mounting.

- The weapon M-48 B-1A2 is equipped with wheels having solid semi-elastic tyres and spring devices with cylindrical coil springs /fig. 51c and 51d/.

a/ The wheels type B-1 with pneumatic tyres
/fig. 51a/

The wheel consists of :

- hub
- disk
- rim
- tyre and tube

The hub is hollow and through it the semi-axle passes which is being secured from the external side by a fastener which in turn is secured with a screw. On the fastener is a movable ring with a lug for hooking the towing rope when pulling out of the weapon is done by its crew.

On the interior edge of the hub is the lock seat serving to fix the spring device to the wheel. The hub is attached to the disk with five bolts.

The edge of the rim has a projection to hold the tyre in place.

Disassembling of the wheel. Disassembling of the wheel is performed as follows :

1. To remove the semi-axle off the wheel proceed as follows :

- unscrew the safety screw from the wheel fastener on the semi-axle /on outer side of the wheel/,
- unscrew the wheel fastener on the semi-axle with the scissors wrench,
- lay down the wheel on the outer side, remove the bronze ring fastener and with the scissor wrench unscrew the bronze ring, while doing this hammer the

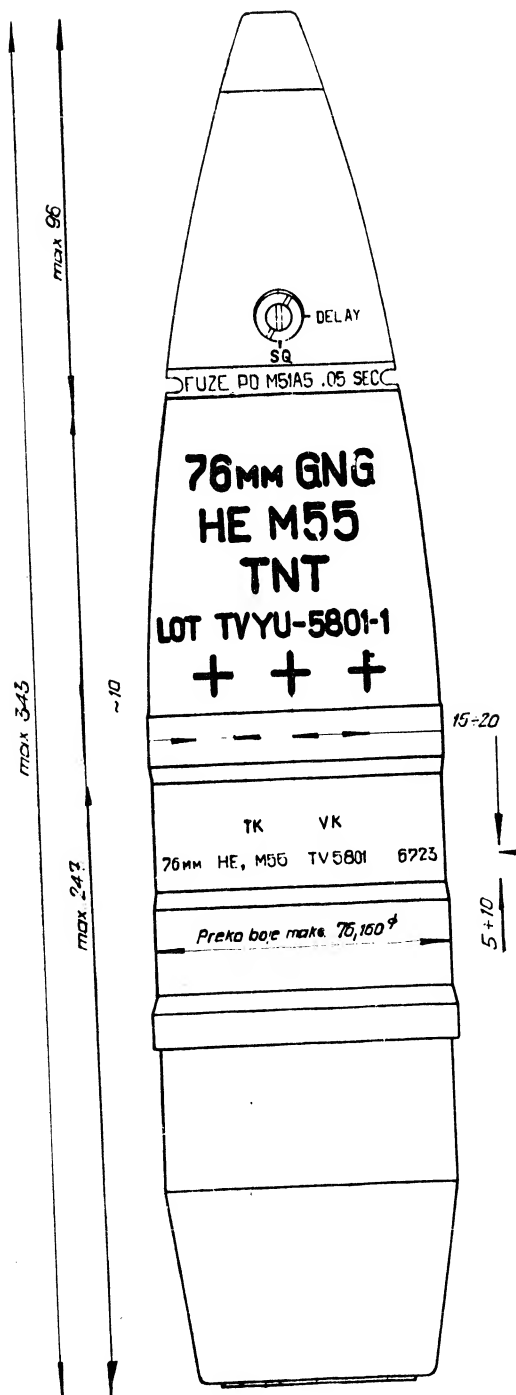


Fig. 71 — HIGH EXPLOSIVE SHELL »HE M 55«

31 /

- semi-axle with a wooden hammer and intervals.
2. Remove the smaller ring with the roller bearing by tapping with a copper hammer until it falls off the axle.
 3. To remove the large ring with the roller bearing proceed as follows :
 - unscrew the fastening screw from the inner ring,
 - unscrew the inner ring with the scissor wrench.
 4. To remove the spring device lock proceed as follows :
 - unscrew the screw,
 - remove the plug with the spring.
 5. Unscrew the fastening screw and remove the rubber buffer.
 6. To remove the wheel it is necessary to :
 - unscrew the wheel fastener safety screw on the semi-axle,
 - unscrew the fastener, and
 - remove the wheel.

By this wheel only defects of the rubber tube and the tyre may be encountered.

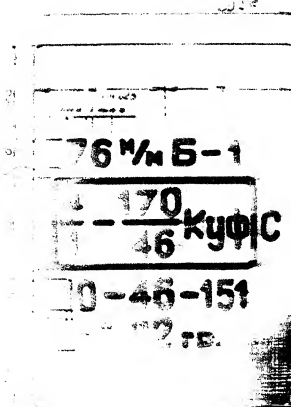
The tyres are subject to injuries from cuts, dents and shocks on the road. Travelling with defective tyres is dangerous because at any moment the tyres may explode and this would cause other damages.

After each travelling the tyres should be carefully checked. Glass, nails, stones and other matter that gets stuck in the tyres should be removed.

When damaging of the tyres occur adhere to the following :

- change the tyre if the extent of the cut has reached or injured the ply,
- the swollen spot on the tyre indicated that its interior is damaged. In such case the tyre should be changed and also if the plying is damaged,
- small cuts on the tyre shoe which have not reached or gone into the plying are not a reason for changing tyres, but such cuts should command close watching,

800-357M
76 мм Б-1
1-170 Куф С
14-49 (141)



ОСНОВНО

ДЕЛИМИЧНО

MARKING ON THE CARTRIDGE CASE AND PROPELLING CHARGE FOR SHELLS 800-357M (HE)

- ОСНОВНО - base charge
- ДЕЛИМИЧНО - increment
- 76 мм Б-1 - caliber and designation of weapon
- 1-170 - number of propelling charge
- 46 - continuation of number
- Куф С - code of manufacture
- 0-46-151 - manufacturer's symbol
- 170 гр - weight of base charge
- 14-49 - weight of increment

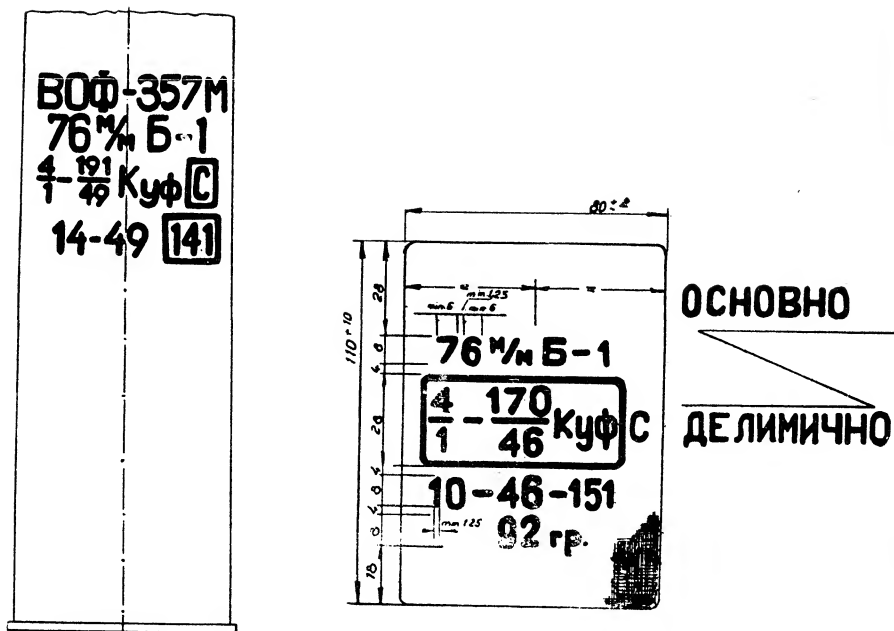


Fig. 72— MARKING ON THE CARTRIDGE CASE
AND PROPELLING CHARGE FOR SHELLS
»ОФ-350« (HE)

ОСНОВНО base charge
ДЕЛИМИЧНО increment
76^{mm}/м Б-1 caliber and designation of weapon

$\frac{4}{1} - \frac{191}{49}$ КУФ С kind of propelling charge

10 ammunition lot number
46 year of manufacture
[191] manufacturer's symbol
192 гр weight of base charge
92 гр weight of increment

- big cuts by which it is almost evident that plying is exposed to further injuries, may be a good reason for changing the tyre,

- in the event the wear of the tyres is uneven owing to inclination of the wheels, and sharp or fan shaped edges appear, the tyres should be interchanged and inclination of the wheels eliminated by changing the bronze bearings.

When the shoe wears to an extent that the tyre gets smooth in the middle, it should be changed. Such tyres should be re-conditioned by vulcanization.

It will not be possible to vulcanize the tyres on which the wear of the rubber reached the plying.

The pressure in pneumatics should be periodically checked and maintained at its standard of 1.8 atm. When checking the pressure, the valve should also be checked for leakage of air. For determining the pressure an accurate gauge should be used always. This gauge should be periodically checked with the control manometer.

Never should the pressure in the tyres be determined by visual estimation or by kicking the tyre. The pressure should be checked only when the tyres are cool.

Removing the tyre from the wheel. To remove the tyre from the wheel, proceed as follows :

- unscrew the nuts which tie the hub to the wheel disc and separate the wheel from the hub,
- release the air from the tube,
- by means of the accessories for expanding the tyre, remove the tyre edge from its seating on the rim of the wheel, taking care not to damage the tube,
- take out the tube, taking care not to damage the air valve body while pulling the tube out,
- for pulling out the tube from the tyre, sharp objects must not be used.

Small punctures on the tube may be repaired with rubber patching tools which are located in the "Spares, accessories and tools set" of the gun.

Fig. 73 — FUZE PD M51A5 — PART

- 1 — Disc, closing
- 2 — Washer, closing disc
- 4 — Firing pin
- 5 — Suport, firing pin
- 6 — Head
- 7 — Detonator
- 8 — Cushion, detonator
- 9 — Screw, detonator retaining
- 10 — Ogive
- 11 — Tube, flash
- 12 — Body
- 13 — Interrupter
- 14 — Cup, spring
- 15 — Sleeve, setting
- 16 — Spring, interrupter
- 17 — Washer, setting sleeve
- 18 — Spring, tension
- 19 — Retainer, setting sleeve
- 20 — Suport, plunger
- 21 — Housing,, plunger
- 22 — Pin, firing
- 23 — Spring, plunger, restraining
- 24 — Washer, lock check
- 25 — Lock, centrifugal plunger pin
- 26 — Pin, lock pivot
- 27 — Body, plunger
- 28 — Pin, centrifugal plunger
- 29 — Spring, centrifugal, pin
- 30 — Retainer, spring
- 31 — Pin, guide
- 32 — Screw, bottom closing
- 33 — Disc, bottom closing screw
- 34 — Charge, delay
- 35 — Relay, M7
- 36 — Holder delay
- 37 — Washer
- 38 — Charge, primer
- 39 — Holder, primer
- 40 — Disc, rotor cover
- 41 — Cover, rotor
- 42 — Rotor
- 43 — Detonator, M17
- 44 — Cushion, detonator
- 45 — Pin, rotor stop
- 46 — Pin, rotor pivot
- 47 — Pin, rotor lock
- 48 — Lock, rotor lock pin
- 49 — Plug, body
- 50 — Screw, centrifugal pin
- 51 — Pin, centrifugal
- 52 — Spring, centrifugal pin lock pin
- 53 — Pin, centrifugal pin lock
- 54 — Spring
- 55 — Screw, lock pin closing
- 56 — Body
- 57 — Cop, booster closing
- 58 — Gcharge, booster closing cup
- 59 — Pellet, booster
- 60 — Cup, booster

View

73

Seriously damaged tube should be replaced with a new one.

Mounting of the tyre on the wheel.- When mounting tyres on the wheel adhere to the following :

- by means of the tyre bar from the "Spares, accessories and tools set" of the gun, get the edge of the tyre over the wheel rim,

- for easier fixing smear the tyre edges with soap,

- insert the tube into the tyre, taking care that it does not crease and that the air valve coincides with hole on the wheel rim,

- pull the air valve through the hole on the wheel rim,

- put some air into the tube and release it several times so that tube may find its proper place in the tyre,

- with the tyre bar get the second edge of the tyre on the wheel rim, making sure it fits properly in the rim,

- fill the tyre with air up to the standard pressure and put the cap on the valve,

- place the wheel on the hub and tighten with nuts.

b/ The wheel with a pneumatic tyre type B1-A1-I/fig. 51b/

This type of wheel is built-in on weapons 76 mm M-48 B-1A1-I together with type B-1A2 Spring device /cylindrical coil spring/.

This wheel with the pneumatic tyre differs in the manner of mounting from the wheel with the pneumatic tyre type B-1.

Beside this there is no seating for spring device lock on the wheel hub because of stability of the pack on the pack-saddle.

Owing to the existing differences in relation to the other two types of wheels, to the following should be given attention :

Fig. 73 — FUZE PD M51A5 — PARTS

- 1 — Disc, closing
- 2 — Washer, closing disc
- 4 — Firing pin
- 5 — Support, firing pin
- 6 — Head
- 7 — Detonator
- 8 — Cushion, detonator
- 9 — Screw, detonator retaining
- 10 — Cap
- 11 — Tube, flash
- 12 — Body
- 13 — Interrupter
- 14 — Cup, spring
- 15 — Sleeve, setting
- 16 — Spring, interrupter
- 17 — Washer, setting sleeve
- 18 — Spring, tension
- 19 — Retainer, setting sleeve
- 20 — Support, plunger
- 21 — Housing, plunger
- 22 — Pin, firing
- 23 — Spring, plunger, restraining
- 24 — Washer, lock check
- 25 — Lock, centrifugal plunger pin
- 26 — Pin, lock pivot
- 27 — Body, plunger
- 28 — Pin, centrifugal plunger
- 29 — Spring, centrifugal, pin
- 30 — Retainer, spring
- 31 — Pin, guide
- 32 — Screw, bottom closing
- 33 — Disc, bottom closing screw
- 34 — Charge, delay
- 35 — Relay, M7
- 36 — Holder, delay
- 37 — Washer
- 38 — Charge, primer
- 39 — Holder, primer
- 40 — Disc, rotor cover
- 41 — Cover, rotor
- 42 — Rotor
- 43 — Detonator, M17
- 44 — Cushion, detonator
- 45 — Pin, rotor stop
- 46 — Pin, rotor pivot
- 47 — Pin, rotor lock
- 48 — Lock, rotor lock pin
- 49 — Plug, body
- 50 — Screw, centrifugal pin
- 51 — Pin, centrifugal
- 52 — Spring, centrifugal pin lock pin
- 53 — Pin, centrifugal pin lock
- 54 — Spring
- 55 — Screw, lock pin closing
- 56 — Body
- 57 — Cup, booster closing
- 58 — Charge, booster closing cup
- 59 — Pellet, booster
- 60 — Cup, booster

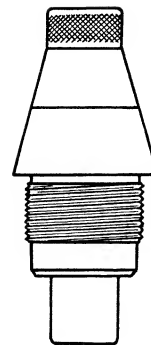
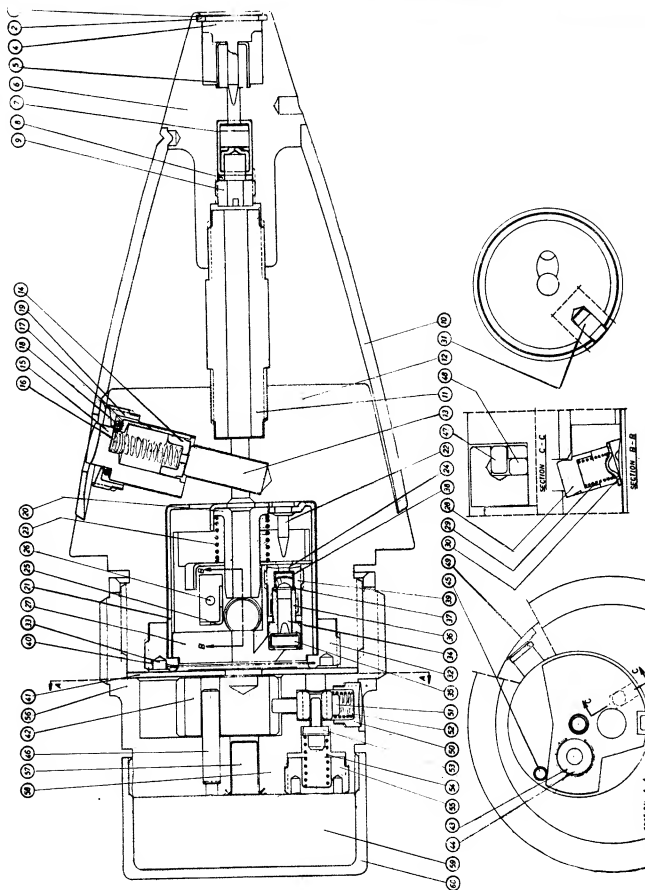


Fig. 74 — KTM-1, FUZE — View

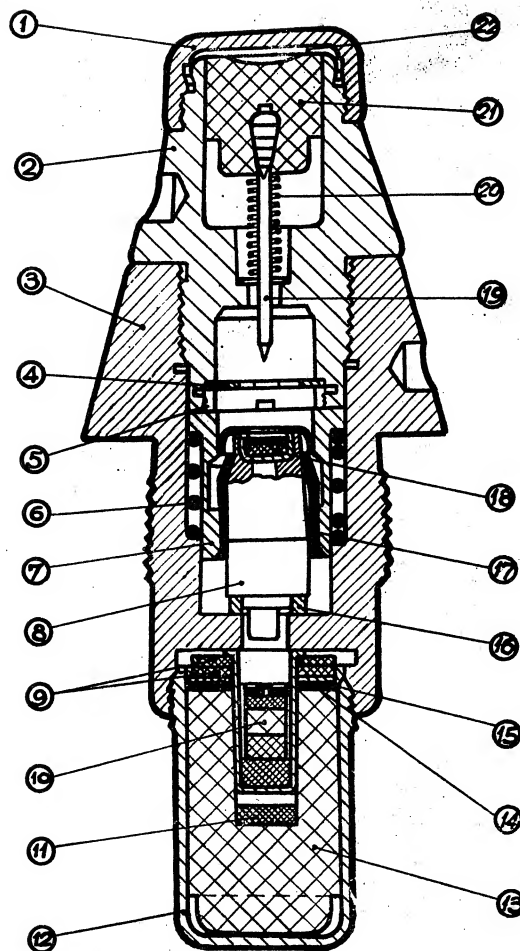


Fig. 76 — FUZE PD »KTM-1« DESIGNED FOR HIH EXPLOSIVE SHELL »HE-OF-350«

- | | |
|------------------------|-----------------------|
| 1 — Cap | 12 — Booster cap |
| 2 — Head | 13 — Booster |
| 3 — Body | 14 — Felt wad |
| 4 — Safety counterstar | 15 — Detonator holder |
| 5 — Locking ring | 16 — Seal ring |
| 6 — Sleeve spring | 17 — Safety sleeve |
| 7 — Sleeve | 18 — Primer |
| 8 — Striker | 19 — Firing pin |
| 9 — Felt wads | 20 — Safety spring |
| 10 — Detonator | 21 — Firing pin head |
| 11 — Felt wad | 22 — Closing disc |

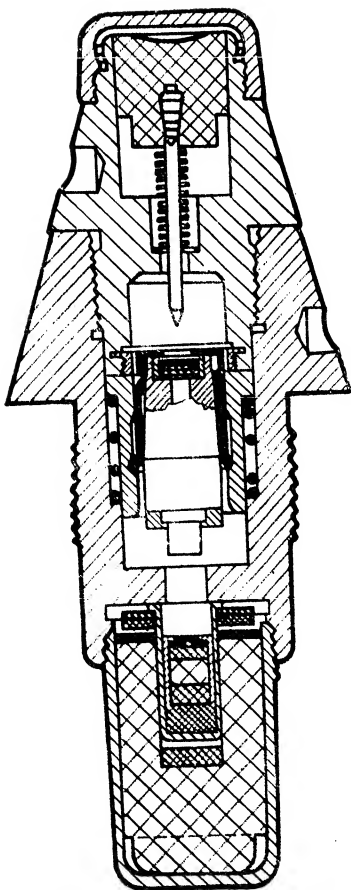


Fig. 77

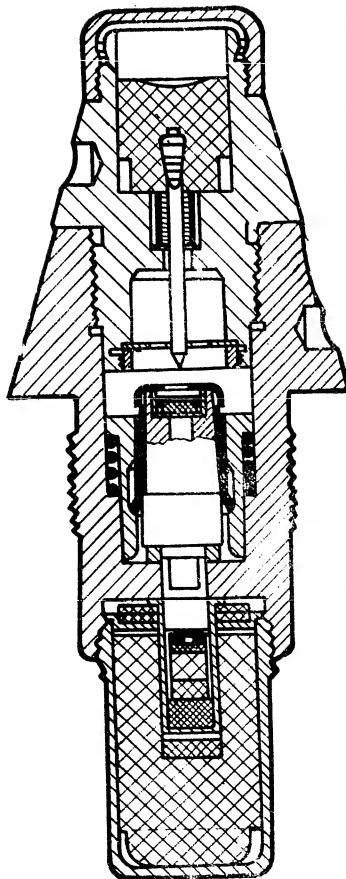


Fig. 78

Fig. 77 -- FUZE «KMT-1» -- Relative position of the parts during flight

Fig. 78 -- FUZE «KTM-1» -- Relative position of the parts in the barrel after firing

75

felt, then the wheels should be replaced. The center hollow in tyre serves for giving it better elasticity.

Removing of the wheel of the semi-axle

To remove the wheel off the semi-axle, it is necessary to :

- unscrew the safety screw from the outer side of the hub and use the wrench to unscrew the hub cover,
- remove the cotter pin from the semi-axle nut,
- unscrew the semi-axle nut,
- remove the washer,
- by light tapping pull out the semi-axle from the hub.

To remove the lug off the hub cover, proceed as follows :

- remove the spring safety element from the cover nut,
- unscrew the nut from the cover,
- remove the lug.

To assemble reverse the above procedure, and pay attention to the following :

Cleaning and greasing of wheels

The exterior of the wheel should be cleaned by washing with water and not greased,

- prior to putting the bearings into the hub make sure they are clean and undamaged.

F. THE CARRIAGE TRAILS

/Fig. 46 and 47/

The carriage has two trails, the left one and the right one, consisting of the front part and the rear part. The trails are square-sectioned, hollow, with spades at their ends.

On the inner sides of the front trails there are tables : on the right one the table indicating the usual recoil-length at various elevations, and on the left one the table with the indication of the type and number of the weapon. Beside that, on the left front trail there is a hook for suspending the battery for the sighting equipment.

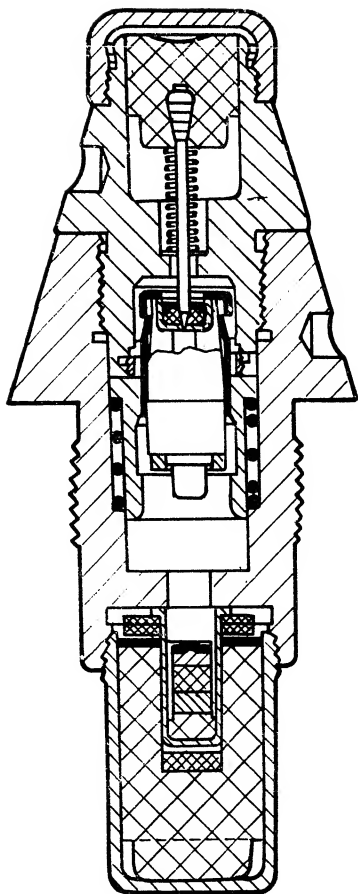


Fig. 79

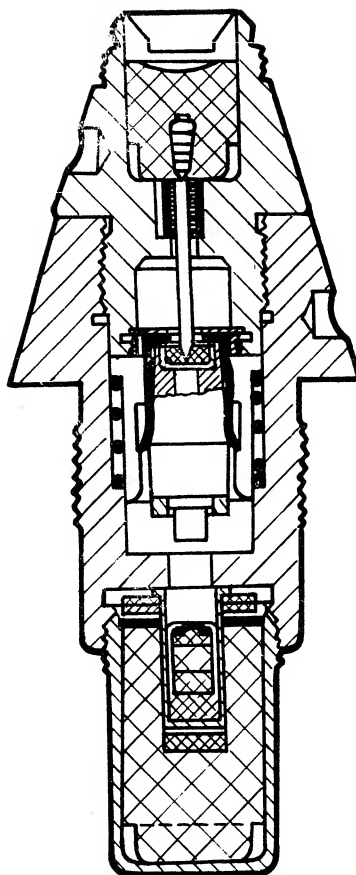


Fig. 80

Fig. 79 — FUZE »KTM-1« — Relative position of the part at impact when the cap is on the fuze (DELAY action)

Fig. 80 — FUZE »KTM-1« — Relative position of the parts at impact when the fuze is without cap (SUPERQUICK action)

Assembling of the trails to the guna/ Assembling of the front parts of thetrails :

- assemble the front part of one trail with the equalizer so that its hinge pins enter their hinge bosses on the equalizer. In doing that, lift up slightly the trail and shift its rear end towards the other trail. After the hinge pins have entered their bosses, shift the trail outwards until the semicircular ends lean against the trail latch of the equalizer, in which moment turn the latch handle forward, thus locking the trail.

b/ Assembling of the rear parts of the trail:

- one man of the crew takes the rear part of the trail while another member of the crew slightly lifts the front part,

- turn the wing of the fastener into its extreme upper position,

- assemble the oblique parts of the front and rear trail so that the rear part's lug enters into its notch on the front trail and closely assemble the oblique surfaces of both trails,

- turn the wing of the fastener downwards so that its tooth catches the dent thus fastening together both trail parts.

c/ The carriage trails for towing are to be folded. To do this, it is necessary :

- lift up the wing fastener,

- lift up the entire trail slightly from

the ground,

- lower the rear part and separate it from

the front part,

- hold the rear part over the front part with the spade turned upwards, and slide it obliquely with its lug under the tooth on the rear end of the trail's front part,

- lower the rear part of the trail onto the

trail front part and pull it slightly forward so that the lug reaches the stop on the front part of the trail,

- turn the wing fastener into its lower position so that with its tooth it enters the notch on the rear part.

The large spades remain attached to the trail ends leaning with their reinforced parts against the front parts of the carriage trails.

After folding both trails it is necessary to fasten them together by means of a latch located in the left trail.

In order to couple the gun to the prime mover or the limber it is necessary to link the latch to the lunette. This is done so that the lunette is made to enter with its two bolts into their seats on the oblique surfaces of the front parts of the trail and passing with its rear end through the circular opening of the latch. While doing this, care should be taken that the tubular seat of the thill be turned up i.e. above the lunette. After attaching the lunette to the latch it should be locked by means of the wing fastener, the latter being secured by its eyelet.

When the gun is to be towed by a prime mover, the lunette is coupled to the pintle on the prime mover and, when horse-towed, to the hook on the limber.

THE LUNETTE - ASSEMBLY

/Fig. 49a and 49b/

The lunette assembly has the function to connect the carriage trails to the trailer /a mechanical prime mover; a limber; or a thill/.

It consists of :

- two tubes longitudinally welded, with two wedges
- the lunette
- the spring
- two fixing nuts, and
- three rings.

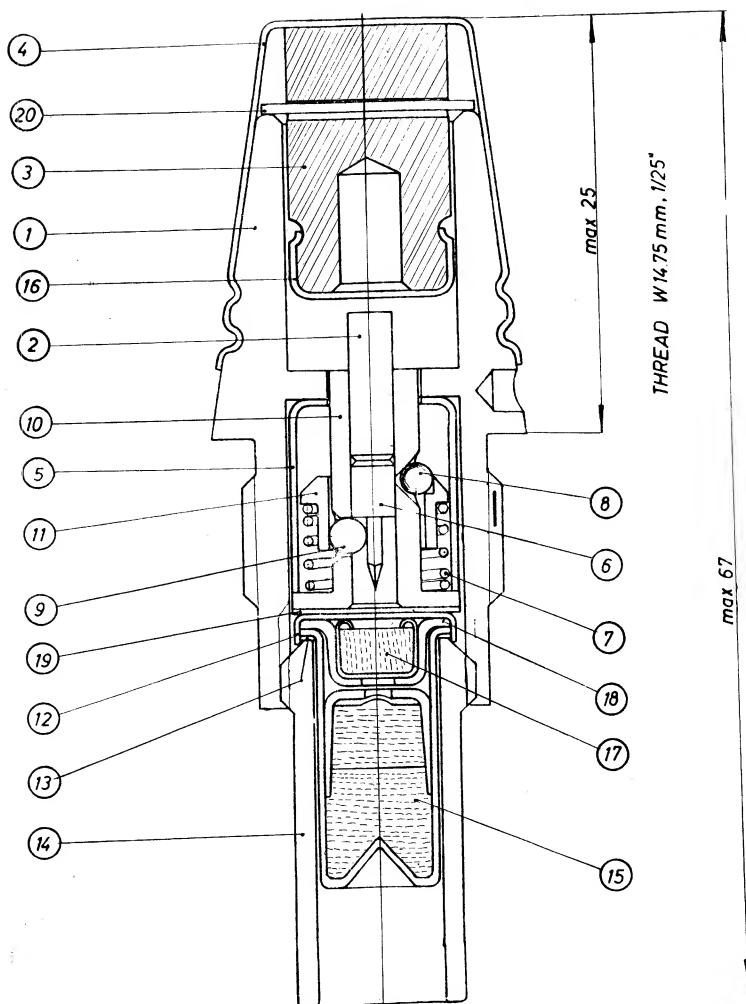


Fig. 81 — FUZE PD DESIGNED FOR HIGH EXPLOSIVE ANTI-TANK SHELL „HE,AT“

- | | |
|------------------------|------------------------|
| 1 — Fuze body | 11 — Safety sleeve |
| 2 — Impact element | 12 — Closing cap |
| 3 — Striker | 13 — Washer |
| 4 — Cap | 14 — Flash tube |
| 5 — Cap shaped support | 15 — Booster |
| 6 — Firing pin | 16 — Striker cap |
| 7 — Spring | 17 — Detonator |
| 8 — Ball | 18 — Detonator holder |
| 9 — Ball | 19 — Resistance washer |
| 10 — Sleeve | 20 — Shear wire |

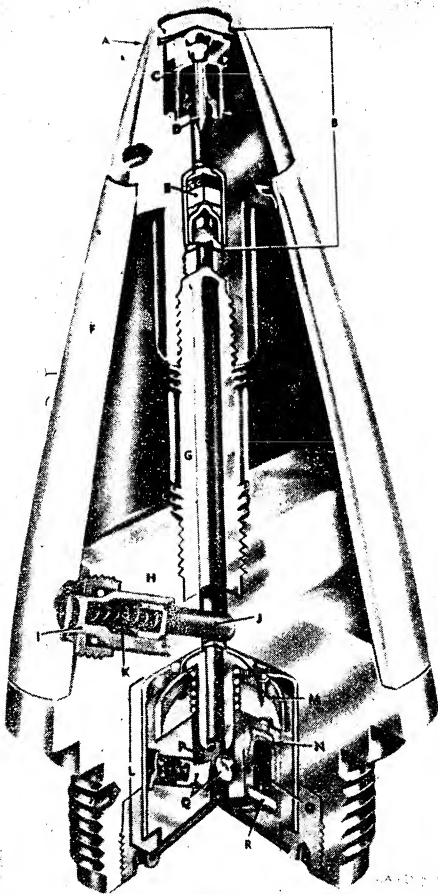


Fig. 82 — FUZE PD M 51 A 5

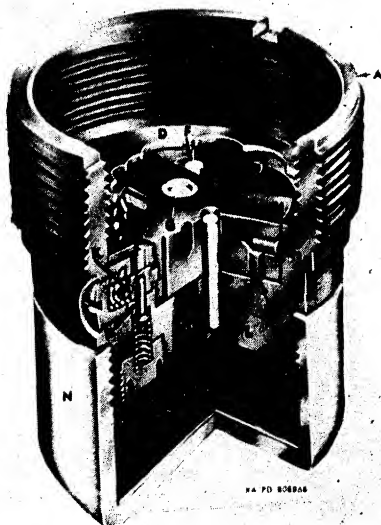


Fig. 83 — BOOSTER FOR
FUZE PD M 51 A 5

trail front part and pull it slightly forward so that the lug reaches the stop on the front part of the trail,

- turn the wing fastener into its lower position so that with its tooth it enters the notch on the rear part.

The large spades remain attached to the trail ends leaning with their reinforced parts against the front parts of the carriage trails.

After folding both trails it is necessary to fasten them together by means of a latch located in the left trail.

In order to couple the gun to the prime mover or the limber it is necessary to link the latch to the lunette. This is done so that the lunette is made to enter with its two bolts into their seats on the oblique surfaces of the front parts of the trail and passing with its rear end through the circular opening of the latch. While doing this, care should be taken that the tubular seat of the thill be turned up i.e. above the lunette. After attaching the lunette to the latch it should be locked by means of the wing fastener, the latter being secured by its eyelet.

When the gun is to be towed by a prime mover, the lunette is coupled to the pintle on the prime mover and, when horse-towed, to the hook on the limber.

THE LUNETTE - ASSEMBLY

/Fig. 49a and 49b/

The lunette assembly has the function to connect the carriage trails to the trailer /a mechanical prime mover; a limber; or a thill/.

It consists of :

- two tubes longitudinally welded, with two wedges
- the lunette
- the spring
- two fixing nuts, and
- three rings.

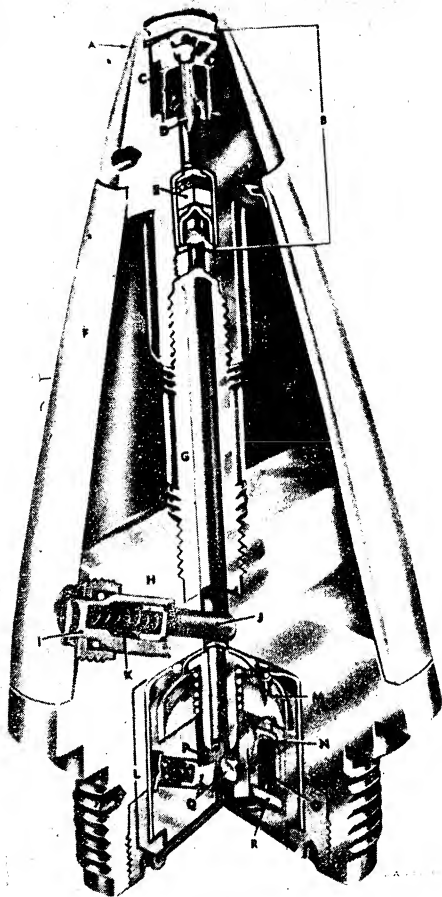


Fig. 82 — FUZE PD M 51 A 5

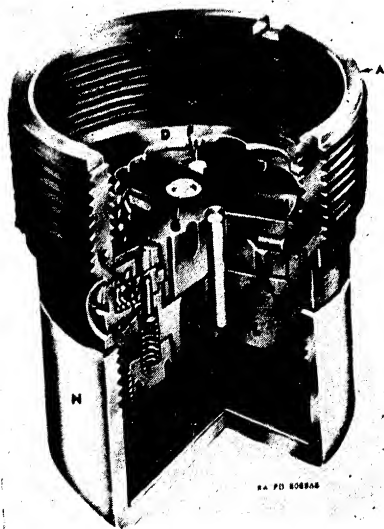


Fig. 83 — BOOSTER FOR
FUZE PD M 51 A 5

The longer lower tube has the function of connecting the lunette with the trail latch, and the shorter upper one for connecting the carriage with the thill when the gun is horse-towed in tandem.

Remark : The weapons 76 mm M-48 B-1A1-I are not provided with lower tubes for attachment of thills because this model is foreseen for motor vehicle towing.

THE CRADLE SUPPORT

/Fig. 35/

The cradle support has the function to hold the cradle when travelling. It consists of :

- the base, and
- the fork.

The assembling and removing of the cradle support

To assemble the cradle support it is necessary to :

- 1 - Elevate the barrel
- 2 - Place the cradle support base on the bottom side of the travelling axle
- 3 - Fix the cradle support base with two wedges
- 4 - Hinge the ends of the wedges
- 5 - Place the fork and turn the wing bolt downwards
- 6 - Lift the cradle support fork and fasten it with the attaching pin.

The removal of the cradle support is done in the reverse order.

F. THE SHIELDS

/Fig. 50/

The shield consist of the left and the right shield interconnected with a link. Between the shields there is an opening for the barrel. This opening can be closed by a movable plate when firing under small angles of elevation.

Each shield consists of an upper and a lower part. The upper parts of the shields are provided with obliquely located hinged sides, and the lower parts are provided with hinged sides, the hinges being provided with

6/2

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15

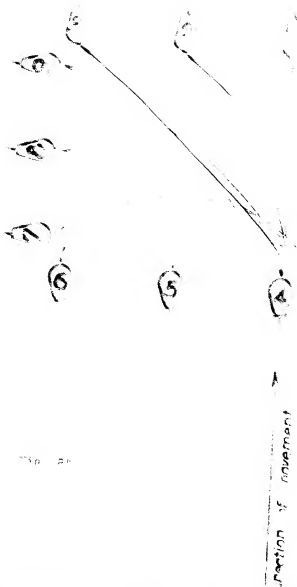
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10



Chief of section



Driver



Gun load number 1
(Top carriage and axle)

Gunner



Cannoneer number 1 Gun load number 2
(Wheels)



Cannoneer number 2 Gun load number 3
(Trails)



Cannoneer number 3 Gun load number 4
(Cradle)



Cannoneer number 4 Gun load number 5
(Hood)



Cannoneer number 5 Gun load number 6
(Tube)



Gun load number 7
(Breech block)



Gun load number 8
(Shields and Sighting Equipment)



Gun load number 9
(Ammunition)



Gun load number 10
(Ammunition)

Fig. 86

Achievement of battle formation

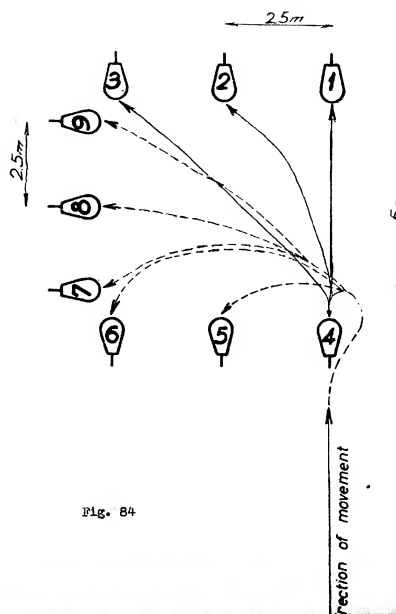


Fig. 84

The longer lower tube has the function of connecting the lunette with the trail latch, and the shorter upper one for connecting the carriage with the thill when the gun is horse-towed in tandem.

Remark : The weapons 76 mm M-48 B-1A1-I are not provided with lower tubes for attachment of thills because this model is foreseen for motor vehicle towing.

THE CRADLE SUPPORT

/Fig. 35/

The cradle support has the function to hold the cradle when travelling. It consists of :

- the base, and
- the fork.

The assembling and removing of the cradle support

To assemble the cradle support it is necessary to :

- 1 - Elevate the barrel
- 2 - Place the cradle support base on the bottom side of the travelling axle
- 3 - Fix the cradle support base with two wedges
- 4 - Hinge the ends of the wedges
- 5 - Place the fork and turn the wing bolt downwards
- 6 - Lift the cradle support fork and fasten it with the attaching pin.

The removal of the cradle support is done in the reverse order.

F. THE SHIELDS

/Fig. 50/

The shield consist of the left and the right shield interconnected with a link. Between the shields there is an opening for the barrel. This opening can be closed by a movable plate when firing under small angles of elevation.

Each shield consists of an upper and a lower part. The upper parts of the shields are provided with obliquely located hinged sides, and the lower parts are provided with hinged sides, the hinges being provided with

Chief of section



Driver



Gun load number 1
(Top carriage and axle)

Gunner



Cannoneer number 1 Gun load number 2
(Wheels)



Cannoneer number 2 Gun load number 3
(Trails)



Cannoneer number 3 Gun load number 4
(Cradle)



Cannoneer number 4 Gun load number 5
(Hood)



Cannoneer number 5 Gun load number 6
(Tube)



Gun load number 7
(Breech block)



Gun load number 8
(Shields and Sighting Equipment)



Gun load number 9
(Ammunition)



Gun load number 10
(Ammunition)



Fig. 86

Achievement of battle formation

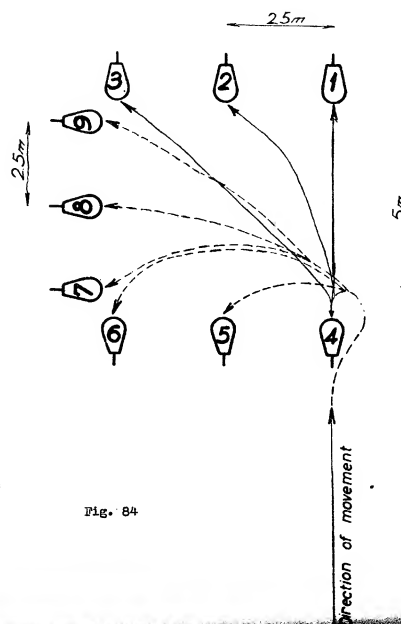


Fig. 84

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provided with hinged sides, the hinges being provided with springs.

The upper sides are folded towards the outer surface of the upper shields and the lower shields are folded towards the inner surface of the upper shields for disassembling and packing.

The shields are provided with two brackets on each side. The shorter bracket is being inserted on the plug by the top carriage shoulder seating, and the longer one is being attached on the projection in form of a plug on each side of the flank of the top carriage. The longer brackets are fastened on the projection by means of a spring loaded bolt. When disassembling the shields the bolt on the bracket should be lifted by means of the hand-grip to displace it from its seating on the carriage flank projection and then the bracket removed from the plug on the carriage.

Disassembling of the shields

To disassemble the shield it is necessary to remove them. To remove the shields proceed as follows:

- remove the plate between the left and the right shield
- open the latch of the upper side and fold it towards the outer side of the shield

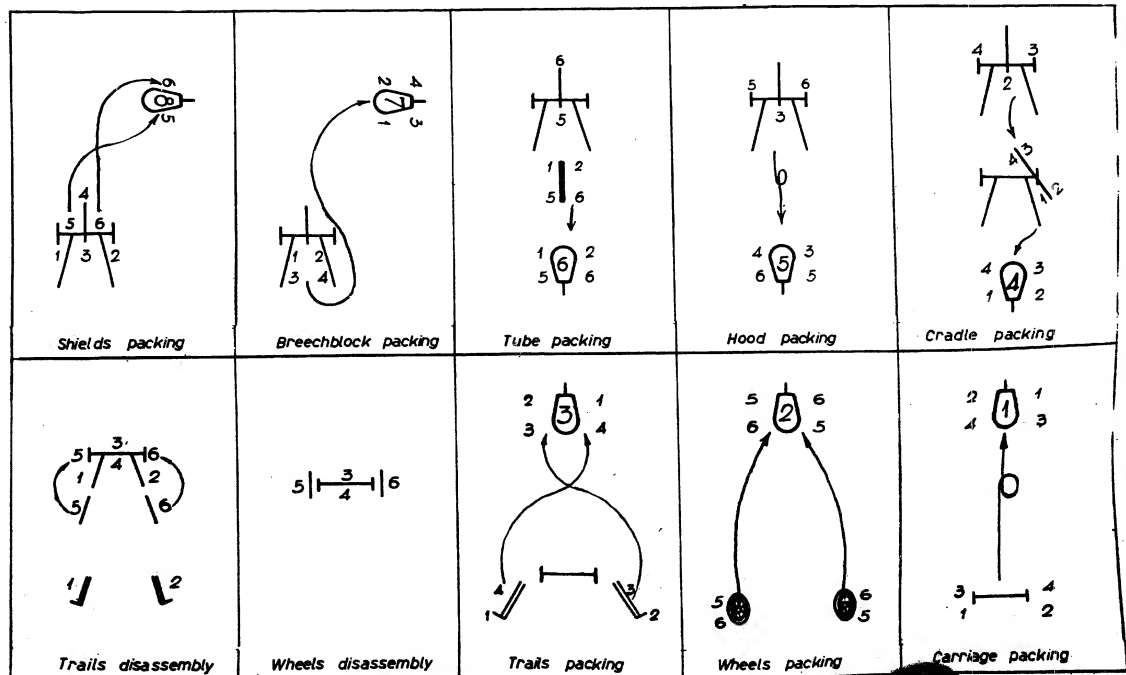
By means of the hand-grip raise the bracket fixing bolt on each side of the carriage flank.

- Unlock the coupling connecting the left and the right shield
- pull the bolt and remove the lower parts of the bracket
- release the shield bracket fasteners from the carriage
- release the latch on the front side, connecting the upper and the lower parts, and
- lift the shield bracket and fold the lower shields inwards.

G. THE THILL

The thill is designed for transporting the gun in tandem team. The thill consists of the fork and

Gun packing (Fig. 85)



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two arms.

The fork has a movable shaft located in the upper tube of the lunette assembly and it is attached by a wedge. On each end of the fork there is a hook for the harness traces and a hole for the thill attaching wedge.

The arms of the thill are made of wood, with iron mountings at their ends for connection with the fork. On the mounting is an attaching wedge.

Attached to the outer side of the thill arms are two movable eyelets for suspending them on the pack saddle and a triangular shackle for connecting the thill with the breaching strap. On their front ends the arms are provided with iron mountings and a strap for attaching the thill to breast collar.

Accessory parts of the thill are : the traces, the traces suspenders, the choke straps and the thill straps, all of these parts together forming the tandem harness.

The weapons 76 mm M.48 B-1A1-I are not provided with thills because this model is foreseen for motor vehicle towing only.

III. THE SIGHTING EQUIPMENT

/Fig. 66a, 66b and 67/

The sighting equipment consists of :

- the range quadrant
- the panoramic telescope
- the gunner's quadrant, and
- the illuminating equipment.

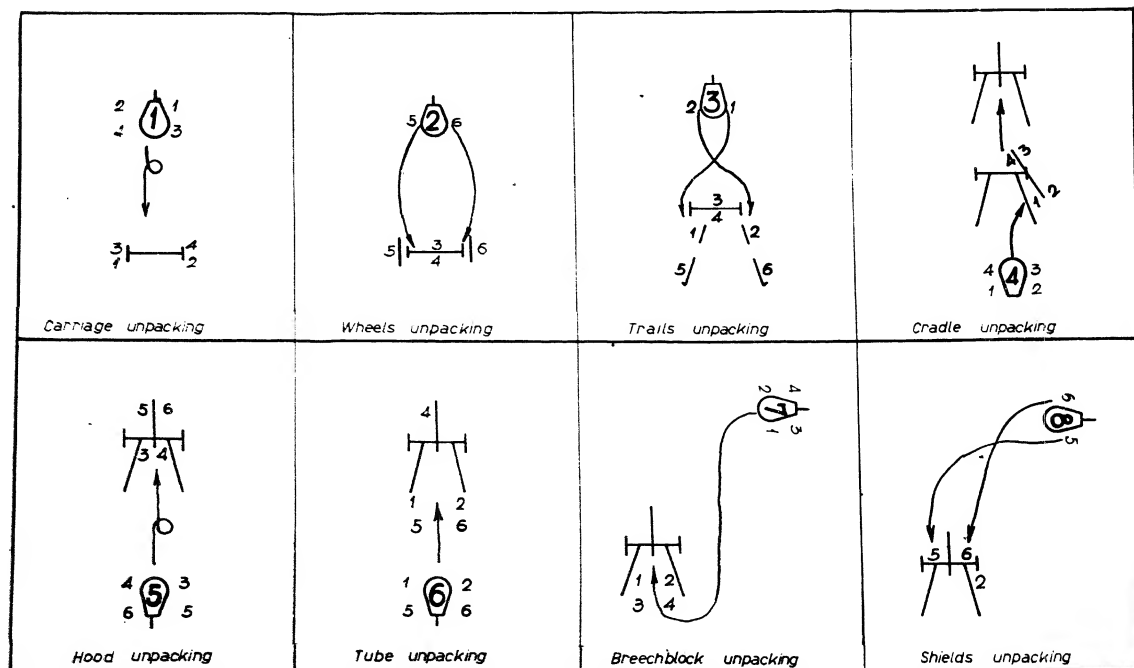
A. THE RANGE QUADRANT

/Fig. 66a and 66b/

The range quadrant consists of :

- the range quadrant mount
- the range quadrant body
- the range quadrant spindle with the range drum
- the angle of site mechanism

Gun unpacking (Fig. 87)



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- the cross level mechanism, and
- the panoramic telescope mount.

The range quadrant elevation scale is an arc-shaped plate attached with two screws. It is divided in 8 parts, each of them having a value of 100 mils. The range drum has a spiral scale, graduated in mils and meters. At the end of the range drum there is a ring with a scale, graduated in mils, serving for range setting. The precision of the readings amounts to one mil.

The basic setting for the range drum is :
range drum scale "0", range plate "0" /zero/.

The angle of site scale is located on the upper part of the range quadrant.

It consists of :

- the drum
- the plate
- the worm, and
- the worm gear rack.

The angle of site drum has the form of an arc-shaped plate attached to the ring. The drum is graduated in 6 parts, marked from 0 to 6, the normal setting being 3-00; the value of each graduation is 100 mils.

The angle of site plate is ring-shaped and graduated from 0 to 100, permitting precise readings down to one mil; each mil is marked by a short line and each tenth mil by a longer line and a number.

The cross level spindle is located in the inner ring of the range drum body, its level being attached to the panoramic telescope support. Its function is to move the range drum in a vertical plane, automatically eliminating the influence of an unlevel position of the gun.

It consists of :

- the worm with its knob
- the worm gear rack, and
- the level.

PREPARING WEAPON FOR FIRING

GUNNER No. 1	ASSISTANT GUNNER No. 2	LOADER No. 3	FUZE SETTER No. 4	CREW MEMBER No. 5	CREW MEMBER No. 6
	1. Pulls lock pin and lifts movable shield plate.	1. With right hand takes right carriage trail handle, lifting trail, whilst with left hand pulls back lunette No. 4 pulled out attaching wedge.	1. With right hand takes left carriage trail handle, lifting trail, whilst with left hand unlocks pin lock and pulls it out.	1. Together with No. 6 removes cover from muzzle, thereafter removes tools from pack animal No. 5.	1. Together with No. 5 removes cover from muzzle, thereafter removes tools from pack animal No. 6.
2. With left foot pushes down left snail spring.	2. With right foot pushes down right snail spring.	2. Hands lunette over to No. 2.	2. With left index finger pulls back the lock and reinstalls carriage trail travelling lock into its seat on the left trail.	2. Lock left snail spring.	2. Locks right snail spring.
3. With right hand takes left trail rear part handle, and with left hand takes spade.	3. Takes the lunette from No. 3 putting it down at right side of gun. With left hand takes right carriage trail rear part handle, and with left hand spade.	3. Pushes out with right hand front and rear part carriage trail lock, and when latch is unlocked, lifts clamping screw with left hand.	3. With left hand pushes out front and rear part carriage trail lock, and when latch is unlocked, lifts clamping screw with right hand.	3. From the left front part of the gun takes with left hand upper cradle support pin and turns it backwards up to the mark, holding with right hand movable part of support, pulling back support when pin has got out.	3. Working from the right side turns with left hand pin handle forward up to the mark, removing support movable part putting it down at the cover.
4. Removes left trail rear part, turns it and puts it into its seat in firing position.	4. Removes right trail rear part, turns it and puts it into its seat in firing position.	4. Spreads right carriage trail and holds it up until No. 2 assembles trail rear part to its seat.	4. Spreads left carriage trail holding it up until No. 1 assembles trail rear part to its seat.	4. Stands at barrel front end, assisting in maintaining balance during assembling of trails.	4. Standing at barrel front end assists in maintaining balance during the assembling of trails.

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SETTING OF THE RANGE DRUM

The scale of the range drum is graduated in mils and in meters.

The setting is done in single mils on the range drum scale and in hundreds of mils on the scale of the range plate.

SETTING OF THE ANGLE OF SITE

The angle of site is set by turning the worm gear knob. The basic setting is 3-00.

The angles of site below horizon are deducted from 3-00, whilst the larger angles are added to 3-00 and transmitted to the gun crew.

INSTALLING AND REMOVING THE RANGE QUADRANT

To install the range drum it is necessary:

- with the left hand turn the clamping screw forward
- with the right hand hold the mount of the range drum and put it in its socket
- loosen the clamping screw
- make sure that the clamping screw has caught the boss of the mount
- set the range quadrant to its basic settings : range drum "0" /zero/, plate "0" /zero/
- angle of site 3-00
- cross level centered
- azimuth scale 32 - 0
- elevating scale 0 - 0
- all levels uncovered
- the range spindle unlocked.

Removing of the range quadrant is done in reversed order.

B. THE PANORAMIC TELESCOPE

/Fig. 67/

The panoramic telescope is designed for sighting in the horizontal level.

It consists of :

- the head /which can be turned/
- the azimuth drum /or scale/

PREPARING WEAPON FOR FIRING

GUNNER No. 1	ASSISTANT GUNNER No. 2	LOADER No. 3	FUZE SETTER No. 4	CREW MEMBER No. 5	CREW MEMBER No. 6
5. Together with No. 2 removes cover from breech ring.	5. Together with No. 1 removes cover from breech ring.	5. Fixes right carriage trail in firing position.	5. Fixes left carriage trail in firing position.		
6. Opens shield opening cover, assembles the sighting devices, setting them into basic setting, and after completing fixing of the carriage trail checks basic setting.	6. Opens breechblock, checks firing lock.	6. Takes hammer and rams in first the left and then the right spade. Thereafter puts down hammer on the right side of the gun. On rocky ground fixing of the trails is done with a pick.	6. Prepares ammunition.	6. Prepares ammunition.	6. Prepares ammunition.
7. Opens breechblock.	7. Takes cleaning rod with brush and cleans barrel.				
8. Rechecks and reports »ready«.					
NOTE: Getting ready for march is done in reverse order, with the exception that installing of the cradle support is done with the assistance of No. 1, after the latter has disposed of the sighting devices (para 6).					

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- the body, and
- the ocular tube.

The azimuth scale of the panoramic telescope consists of the drum attached to the telescope head, and a micrometer scale put on the right end of the worm shaft. The drum is graduated in 64 parts, and the micrometer scale in 100 parts. One full turn of the micrometer, i.e. for 100 parts corresponds to a turning of the optical axis of the panoramic telescope in the horizontal plane for $1/6400$ part of the circle.

In general, a distant and fairly conspicuous object is selected to serve as an aiming point.

Located inside the panoramic telescope is the reticle pattern for direct aiming of moving targets: by means of this reticle pattern the range and the lead are taken.

N O T E : When firing at moving targets, the elevating scale on the panoramic telescope must be set on "0"/zero/

Installing of the panoramic telescope on the range quadrant

- 1 - Take the panoramic telescope with the left hand by its body, above the azimuth drum so that the eyepiece is turned backwards
- 2 - Put the panoramic telescope onto its socket so that the eyepiece tube enters the slit in the mount and the panoramic telescope to be vertical
- 3 - With the right hand turn the clamping screw of the panoramic telescope
- 4 - Lower the panoramic telescope into its socket and attach it with the clamping screw.

Removing of the panoramic telescope from the range quadrant

- 1 - Set the panoramic telescope at its basic setting
- 2 - Loosen the clamping screw
- 3 - With the right hand turn the wing of the clamping screw in order to release the panoramic telescope

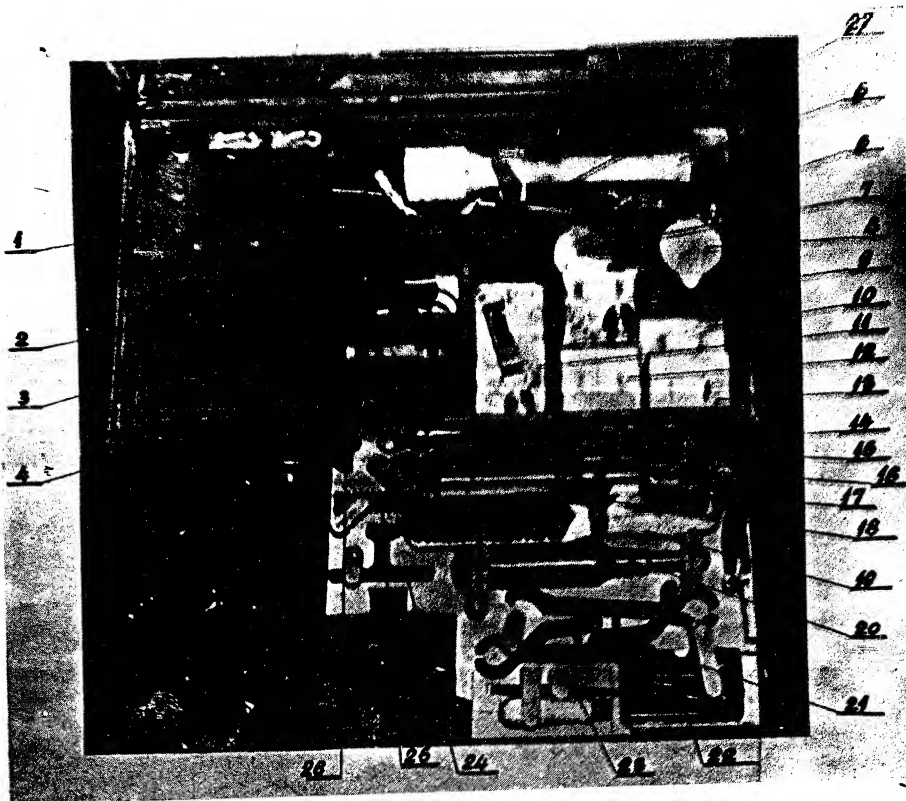


Fig 61 -- GUN SPARE PARTS TOOL AND ACCESSORIES

N	NOMINATION	Quantity	N	NOMINATION	Quantity
1	Airpump for pumping-up wheel tires	1	10	Vaseline container, capacity 150 gr	1
2	Sighting device box	1	11	Kerosene container, capacity 1 kg	1
2	Range quadrant	1	12	Solidol or ball bearing grease container, capacity 500 gr	1
2	Panoramic telescope	1	13	Gun grease container, capacity 500 gr	1
2	Sighting device screw driver	1	14	Aimer guard	1
2	Try element metal container	1	15	Tire dismantling lever	1
2	Quadrant with box M 50 and screw driver	1	16	Tire dismantling lever	1
2	Sighting device brush	1	17	Extractor, hand	1
2	Housing with elec. bulb and cable 1.020 m long	2	18	Recoil regulation wrench 27 mm	1
3	Container with wade and chamois skin and 3 spare bulbs	1	19	Breechblock cleaning brush	1
4	Artillery lantern	1	20	Tecalemit pump	1
5	Compressor (pusher)	1	21	Wrench for fuze mounting and taking off fuze cap	2
6	Glove, right hand for gun leader.	1	22	Battery hand lamp	1
7	Clamp for vulcanizing	1	23	Screw driver with handle 5x8	1
8	Rubber patches for vulcanizing — pack	1	24	Primer wrench	1
9	Gun oil container, capacity 500 gr	1	25	Striker spring	1
			26	Firing pin	1
			27	Lanyard, short	1

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- 4 - With the left hand lift the panoramic telescope out of its socket.

C. THE ILLUMINATING EQUIPMENT OF THE SIGHTING EQUIPMENT

/ Fig. 65 and 67 /

The illuminating equipment of the sighting equipment consists of :

- the box
- the cables
- two instrument lights
- the battery.

The battery box is suspended on the inner side of the left front trail. One of the instrument lights is being installed on the panoramic telescope eyepiece, and the other one is movable and serves for illuminating the other sighting instruments.

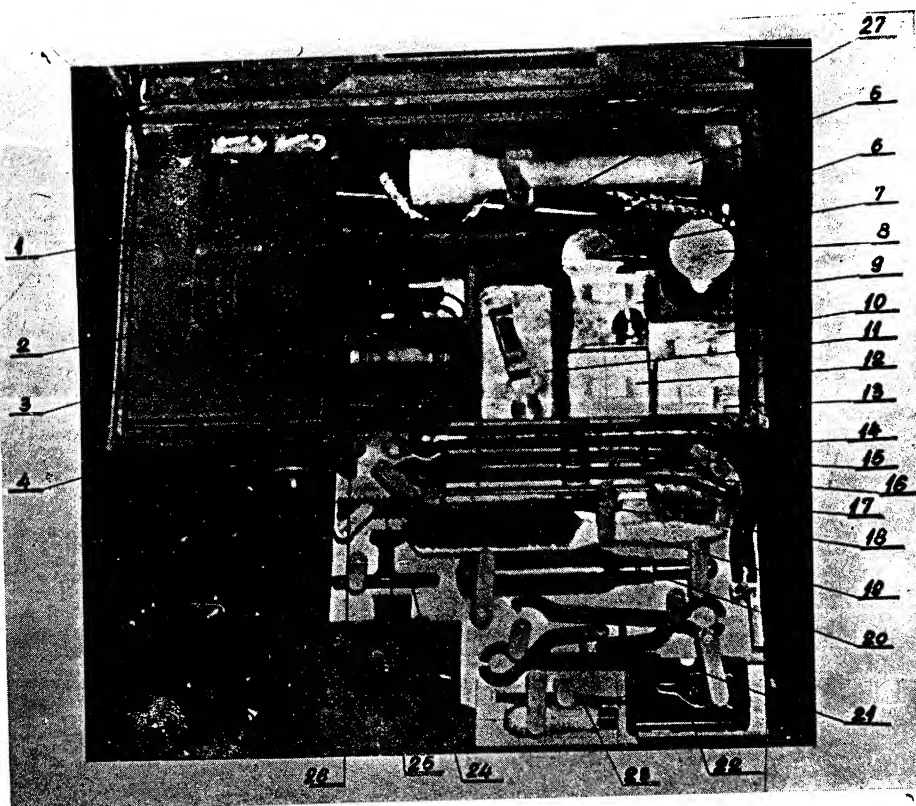


Fig 33 -- GUN SPARE PARTS TOOL AND ACCESSORIES

Nº	NOMINATION	Quantity	Nº	NOMINATION	Quantity
1	Airpump for pumping-up wheel tires	1	10	Vaseline container, capacity 150 gr	1
2	Sighting device box	1	11	Kerosene container, capacity 1 kg	1
2	Range quadrant	1	12	Solidol or ball bearing grease container, capacity 500 gr	1
2	Panoramic telescope	1	13	Gun grease container, capacity 500 gr	1
2	Sighting device screw driver	1	14	Aimer guard	1
2	Try element metal container	1	15	Tire dismantling lever	1
2	Quadrant with box M 50 and screw driver	1	16	Tire dismantling lever	1
2	Sighting device brush	1	17	Extractor, hand	1
2	Housing with elec. bulb and cable 1.020 m long	2	18	Recoil regulation wrench 27 mm	1
3	Container with wade and chamois skin and 3 spare bulbs	1	19	Breechblock cleaning brush	1
4	Artillery lantern	1	20	Tecalemit pump	1
5	Compressor (pusher)	1	21	Wrench for fuze mounting and taking off fuze cap	2
6	Glove, right hand for gun leader.	1	22	Battery hand lamp	1
7	Clamp for vulcanizing	1	23	Screw driver with handle 5x8	1
8	Rubber patches for vulcanizing -- pack	1	24	Primer wrench	1
9	Gun oil container, capacity 500 gr	1	25	Striker spring	1
			26	Firing pin	1
			27	Lanyard, short	1

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- 4 - With the left hand lift the panoramic telescope out of its socket.

C. THE ILLUMINATING EQUIPMENT OF THE SIGHTING EQUIPMENT

/ Fig. 65 and 67 /

The illuminating equipment of the sighting equipment consists of :

- the box
- the cables
- two instrument lights
- the battery.

The battery box is suspended on the inner side of the left front trail. One of the instrument lights is being installed on the panoramic telescope eyepiece, and the other one is movable and serves for illuminating the other sighting instruments.

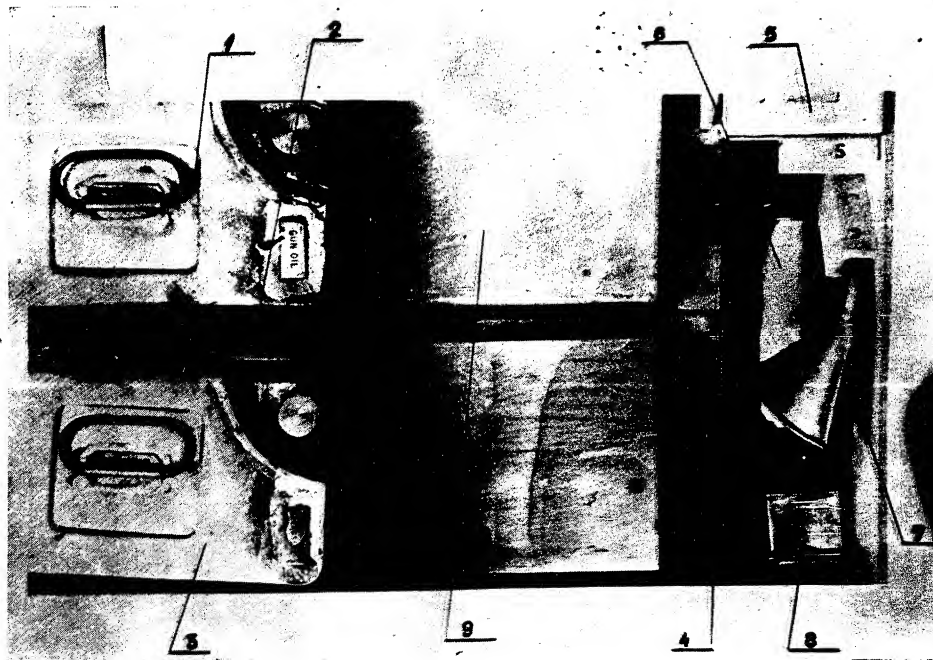


Fig. 89 — BATTERY SET SPARE PARTS TOOLS AND ACCESSORIES
Box No. 1

№	NOMINATION	Quantity	№	NOMINATION	Quantity
1	Gun oil container, capacity 2,300 kg	1	6	Graduated fluid container capacity 0.5 liters	1
2	Solidol or ball-bearing grease container, capacity 2,300 kg	1	7	Funnel with sieve for fluid filling	1
3	Kerosene container, capacity 2 kg	2	8	Gase with wade and charmois skin with 2 bubble levels with holders for elimination of Wheel inclination and 2 bubble levels with holders for angle of site device	1
4	Glass bottle for hydraulic brake and recuperator fluid, capacity 2,250 kg	2	9	Wooden boxes for glass bottles	2
5	Instrument grease container capacity 150 gr.	1			

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- 4 - With the left hand lift the panoramic telescope out of its socket.

C. THE ILLUMINATING EQUIPMENT OF THE SIGHTING EQUIPMENT

/ Fig. 65 and 67 /

The illuminating equipment of the sighting equipment consists of :

- the box
- the cables
- two instrument lights
- the battery.

The battery box is suspended on the inner side of the left front trail. One of the instrument lights is being installed on the panoramic telescope eyepiece, and the other one is movable and serves for illuminating the other sighting instruments.

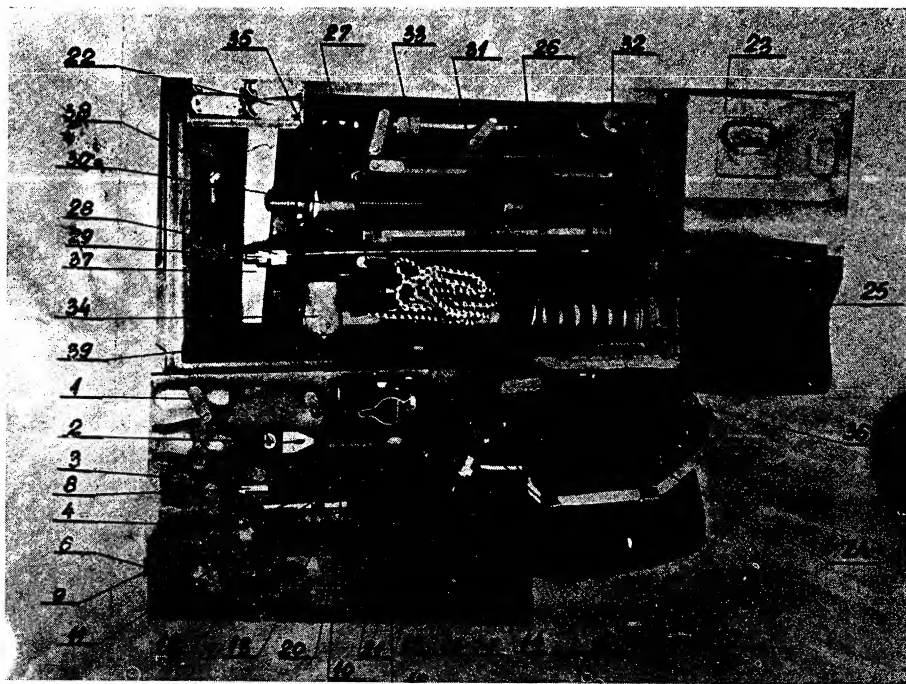


Fig. 89a — BATTERY SET SPARE PARTS TOOLS AND ACCESSORIES

№	NOMINATION	Quantity	№	NOMINATION	Quantity
1	Screwdriver	1	23	Gun grease container, capacity 2.400 kg	1
2	Combination pliers, 190 mm long	1	24	Fabric bag	1
3	Safety pin for elbow lever	1	25	Tool spread cloth	1
4	Recuperator valve and fluid filling plug wrench	1	26	Spring device spring	1
6	Manometer wrench 22×27	1	27	Lever dia, 14.5×400 for socket wrenches	1
7	Semiround file 30×300	1	28	Copper tube dia 8 mm	1
8	Trigger	1	29	Reducer for connection between bottle and copper tube	1
9	Fluid filling hole screw-plug	1	30	Device for dismantling and assembly of equilibrator	1
10	Air valve	1	31	Wrench for elbow lever cover	1
11	Brass punch dia 8×100	1	32	Equilibrator regulating wrench	1
12	Punch dia 3×110	1	33	Fluid filling pump	1
13	Punch dia 5×110	1	34	Zinc hammer dia 32×98	1
14	Three way tap	1	35	Socket wrench for fluid filling	1
15	Striker spring	1	36	Spring, rubber bumper	1
16	Trigger tooth spring	1	37	Hammer 37×37×132	1
17	Pliers for nails 195 mm long	1	38	Universal wrench 280 mm long	1
18	Firing pin gage	1	39	Housing with electrical bulb and cable 1.020 long for lighting of sighting device	1
19	Manometer, 160 atm.	1			
20	Battery hand lamp	1			
21	Valve pusher for checking air in fluid	1			
22	Seating for dry elements	1			

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P A R T IIII. PRESERVATION AND MAINTENANCE OF THE GUNINSPECTION OF THE GUN PRIOR TO FIRINGGeneral

The lasting and trouble-free service of the gun as well as its readiness for action depend on proper handling, maintenance and careful preparing prior to firing.

Prior to firing it is obligatory that the guns should be inspected by the battery commander, the platoon commander, the N C O in charge of the gun and by the artillery mechanics.

The inspection is carried through in the following way :

- Check the gun for availability of all parts
- Check the barrel for its connection with the breech-ring and the mantle, and then the muzzle brake for its connection with the mantle
- Check the bore and the chamber
- Check the barrel for its secure connection with the cradle over the hydraulic recoil brake and the recuperator, and the connection of the cradle with the carriages
- Inspect the breech-block
- Check the function of the semi-automatic mechanism
- Check the function of the traversing and elevating mechanisms
- Check the function of the equilibrators
- Test the locking of the springs
- Check the locking of the carriage trails
- Check the hydraulic recoil brake and the pneumatic recuperator for proper functioning, and
- Check the sighting equipment.

The standard recoil lengths are indicated on the plate located in the right trail of the weapon and they should be within the following limits during firing

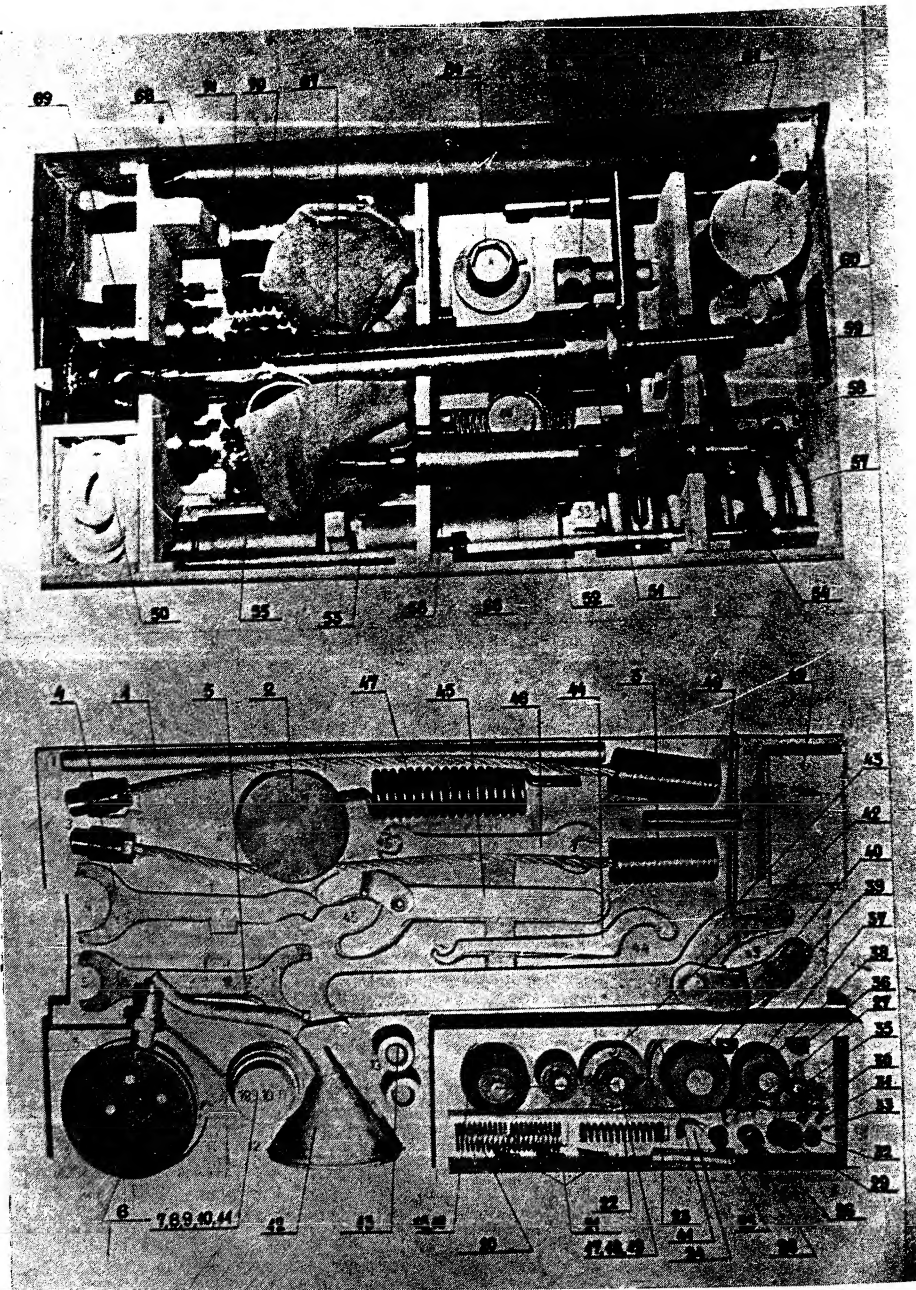


Fig. 90 — BRIGADE SET SPARE PARTS TOOLS AND ACCESSORIES

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with the fourth zone :

Elevation - 15° to 0° recoil length	710 - 790 mm
0° to 10° recoil length	710 - 790 mm
15° recoil length	700 - 780 mm
20° recoil length	670 - 750 mm
25° recoil length	625 - 740 mm
30° recoil length	570 - 720 mm
35° recoil length	495 - 630 mm
40° to 45° recoil length	390 - 500 mm

CHECKING OF THE HYDRAULIC RECOIL BRAKE AND OF THE PNEUMATIC RECUPERATOR

Checking of the hydraulic recoil brake and of the pneumatic recuperator consists of :

- 1 - Checking of the recoil brake for its fluid contents
- 2 - Checking of the pneumatic recuperator.

1/ Checking the quantity of fluid in the recoil brake

For checking the quantity of fluid in the recoil brake it is necessary to :

- give the cradle elevation of 45°
- remove the protecting casing of the cradle
- loosen the screw bearing the marking "V" with a wrench and to unwind it for four rotations and if fluid appears through the valve it is the sign that the compensator contains fluid;
- if no fluid appears on the opening of the valve bearing the marking "V", then valve "T" should be opened, the funnel with the sieve taken and placed in the opening from which this screw was taken out,
- pour fluid until it appears on the opening,
- screw in the screw "T" in its place,
- screw in partly the screw bearing the marking "V", where the air is going out,
- with the pump under pressure inject the reverse fluid into the compensator /50 cm³/,
- attach the cradle protecting casing and tighten it.

Fig. 90 — BRIGADE SET SPARE PARTS TOOLS AND ACCESSORIES

Nº	NOMINATION	Quantity	Nº	NOMINATION	Quantity
1	Lever dia 14.5×400 for socket wrench	1	39	Rubber ring, middle cylinder front sealing	3
2	Rubber bumper for spring	1	40	Rubber ring ϕ 51.5 × ϕ 42.5 × 12, recuperator cylinder	2
3	Equilibrator steel rope	2	41	Rubber ring ϕ 21 × ϕ 46 × 10, floating piston	2
4	Double end wrench for part No. 792, 19127 and 8072	1	42	Rubber bumper	2
5	Double end wrench with extensions for part No. 8016 and 16111	1	43	Wrench, scissor type, larger	1
6	Manometer, 160 atm.	1	44	Wrench, double end, hook-type for part No. 19279, 8183 and 8051	1
7	Copper ring dia 52× dia 57×2 counter-piston rod case sealing	2	45	Wrench, scissor-type, smaller	1
8	Copper ring ϕ 51.5 × ϕ 54×2 front sealing of middle cylinder	2	46	Wrench, double end 14 × 17	1
9	Copper ring ϕ 51 × ϕ 54 × 3 recoil regulator	2	47	Breech block closing spring	1
10	Copper ring ϕ 54 × ϕ 58 × 2 recuperator cylinder	2	48	Recuperator valve wrench 7 × 7	1
11	Copper ring ϕ 45 × ϕ 50 × 2 valve case	1	49	Case with wade and chamois skin with 3 bubble levels with holders for elimination of wheel inclination and 3 bubble levels with holders for angle of site device	1
12	Funnel with sieve for refilling of fluid	1	50	Tallowed wick 8 × 8 for stuffing boxes	1
15	Rubber ring ϕ 42 × ϕ 48 × 3 recoil regulator	2	51	Device for assembling and dismantling of equilibrator	1
16	Rubber ring, compensator floating piston and piston rod sealing	4	52	Pump for refilling of fluid	1
17, 18	Rubber ring, recuperator and recoil regulator sealing	4 + 4	53	Copper tube ϕ 8 mm	1
20	Sighting device mounting bearing spring	2	54	Reducer for connection of bottle and copper tube	1
21	Split pin ϕ 2.7 × 34, recuperator piston	2	55	Socket wrench for part No. 8068, 8107, 8108, 8113 and 8072	1
22	Extractor shaft pusher spring	3	56	Socket wrench, double end for part No. 8014, 8046 and 23877	1
23	Firing pin protrusion gage	1	57	Spring device spring	1
24	Recocking handle spring	1	58	Socket wrench, double end for part No. 2829 and 29294	1
25	Cocking stop spring	1	59	Cocker	1
26	Semi-automatic mechanism retainer spring	1	60	Three way tap	1
27	Split pin, elbow lever brake shaft	1	61	Graduated fluid container, capacity 0,5 liter	1
28	Recoil indicator spring	1	62	Tecalemit pump	1
29	Semi-automatic mechanism retainer	1	63	Equilibrator regulating wrench	1
30	Middle cylinder front sealing spring	2	64	Socket wrench for refilling of fluid	1
31	Pin ϕ 2 × 32, hydraulic brake piston rod	1	66	Breech block opening spring	1
32	Firing pin	1	67	Cover for brush-cleaner	2
33	Sighting device, checking screwdriver	1	68	Cleaner rod for barrel	2
35	Rubber sealing, recoil regulator	2	69	Valve pusher for checking air in fluid	1
36	Rubber sealing, recoil regulator	2	70	Socket wrench, double end, for part No. 8117, 23948 and 29915	1
37	Rubber ring, recuperator piston	4	71	Wrench for adjustment of floating piston	2
38	Rubber sealing, middle cylinder front sealing	2			

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When there is sufficient fluid in the compensator then the compensator spring is compressed so much that on the opening of the cradle /on the bottom side/ four rings of the spring are visible.

2/ Checking the recuperator

When checking the recuperator firstly the quantity of fluid in the recuperator should be checked, and when ~~this~~ is determined /when it is added or reduced to the standard quantity/ then the recuperator is being filled with azote.

To check the quantity of fluid in the recuperator it is necessary to :

1. Determine the initial pressure in the recuperator by :

- unscrewing the valve box cover screw,
- unscrewing the threeway tube seating plug screw,
- screwing in the threeway tube with the pressure gauge,
- unscrewing the valve so that the pressure from the recuperator enters into the pressure gauge,
- screwing in the valve again after the reading of the actual pressure has been taken and recorded from the pressure gauge;

2. The recuperator contains approximately 165 grams of reserve fluid. If there is reserve fluid in the recuperator then recoil speed regulator shaft is located in its seating. If there is a shortage of 140 grams of fluid in the recuperator, the shaft remains in place and the firing may be continued until the shortage of fluid in the recuperator exceeds 140 grams. When the shortage of fluid in the recuperator exceeds 140 grams then the regulator shaft, owing to pressing of the floating piston, will leave its seating; this being at the same time the signal that the shortage of fluid in the recuperator is over 140 grams and therefore fluid should be added. This must be strictly borne in mind. When a total of approximately 165 grams of fluid is lost, the

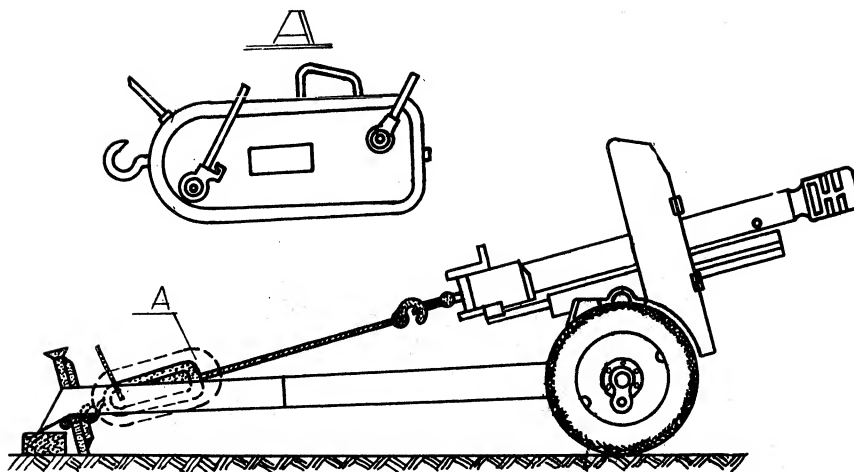


Fig. 91 — ARTIFICIAL RECOILING OF THE BARREL WITH THE
TIRFOR »MINES« DEVICE

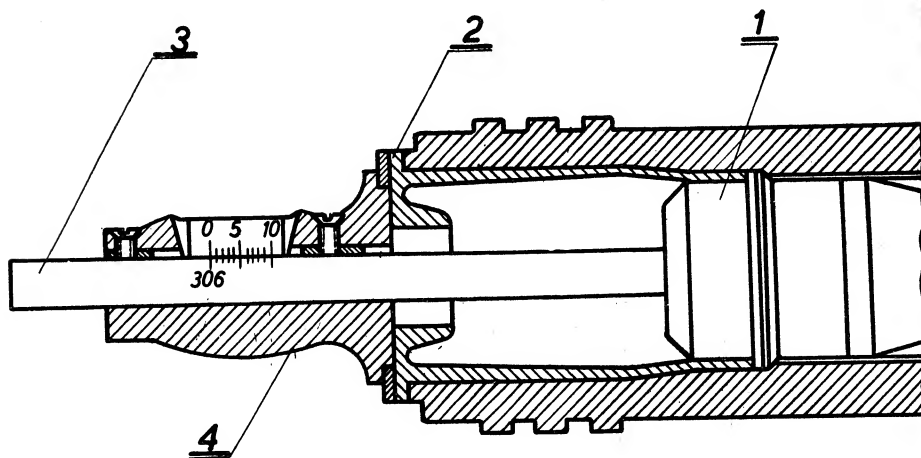


Fig. 92 — FORCING CONE MEASURING

- | | |
|--------------------|---|
| 1 — projectile | 3 — depth measuring instrument |
| 2 — cartridge case | 4 — handle with the Vernier scale for reading |

regulator shaft leaves its seating for 8 to maximum 11 mm and when it is in this position the firing must be stopped.

Adding of fluid in the recuperator is done with a pump under pressure and to perform this proceed as follows :

- remove the barrel, the breechring and the barrel mantle,
- unscrew the valve safety screw,
- take the pump with fluid and screw it in- to the shaft,
- pump the fluid through the valve until the regulator shaft returns in place, and then add 140 grams of fluid more to reach the standard quantity of fluid in the recuperator.

When adding fluid special attention should be given not to add more than prescribed. In case more than the prescribed quantity of fluid is added, owing to the impact of the floating piston the middle cylinder shall be damaged, i.e. its bulkhead driven out. Therefore after filling the quantity of fluid required to separate the floating piston from the regulator shaft, the balance of 140 grams of fluid serving as reserve must be accurately weighed.

When adding or taking out of a determined quantity of fluid, after the performed work the pressure should be brought to 62 atm; to do this proceed as follows:

- unscrew the plug screw for the seating of the threeway tube,
- screw in the conducting tube with the compressed azote bottle and bring the pressure in the recuperator to its standard,
- screw in the valve,
- remove the threeway tube with the pressure gauge,
- screw in the plug into the seat of the threeway tube of the valve box.

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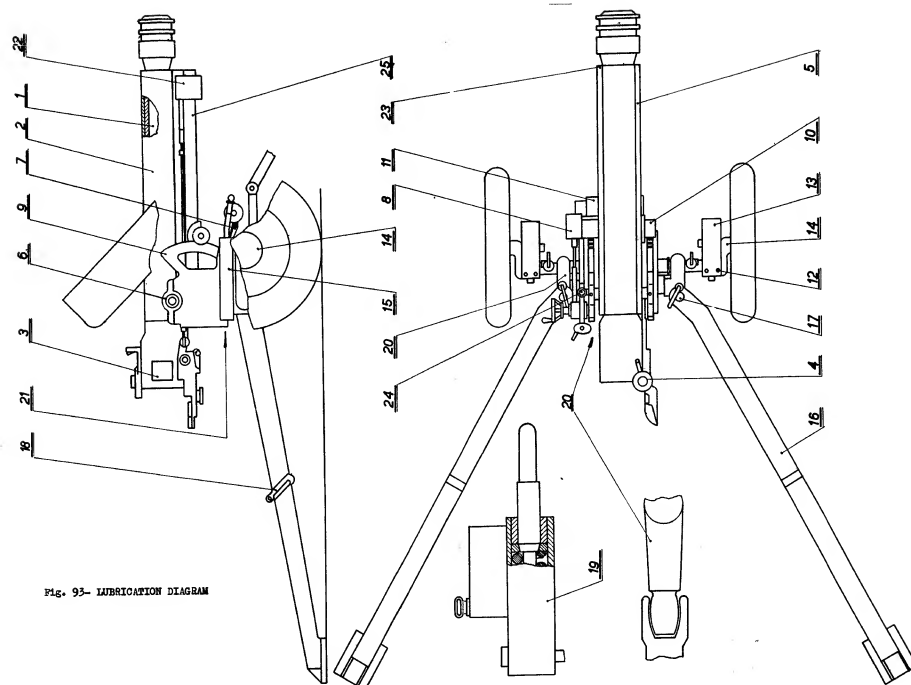


Fig. 93- LUBRICATION DIAGRAM

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Remark:

Filling of the recuperators is being done exclusively with azote from steel cylinders. The azote is supplied in high pressure steel cylinders of 150 Atm. The azote cylinders may have the capacity of 13.4 dm³, which contains 1900 dm³ of azote /ø 140 x 1045/ or a capacity of 40 dm³ which contains 6000 dm³ of azote /200 x 1045/. For easy identification the valve caps on the azote steel cylinders are painted yellow. In view that in similar steel cylinders also other gases are being supplied, for example : hydrogen, oxygen and carbon dioxide, etc., prior to using the contents of the steel cylinder should be checked to make sure the steel cylinder contains azote.

The azote cylinder valves on the outlet portion are provided with a metric threading M.22 x 1.5. The threading should be checked by screwing on the hose fitting by hand. When doing this checking no force should be used.

Even if the threadings correspond to the fitting of the filling hose, it could be that the steel cylinders are filled with some other gas by mistake. The errors in marking and filling the azote cylinders may cause serious casualties.

To prove that the steel cylinder contains azote, proceed as follows :

- open the valve abruptly so that the pressure drives out the dirt and moisture,
- if the valve gets white or very cold then it means the steel cylinder contains carbon dioxide,
- several centimeters away from the valve in the gas stream a lighted cigarette should be held with pliers or scissors. When doing this never hold the cigarette in hand.

The valve should be slowly opened and if under the gas effect the cigarette glows intensively and then takes to flame, it means the steel cylinder contains oxygen and if the gas ignites then it is hydrogen. And

if the gas creates yellow flame with smoke then it is acetylene.

If the force of the gas coming out leads to extinguishing of the cigarette it means the steel cylinder contains azote.

Only in exceptional cases, under special orders, air may be filled into the recuperator. In such exceptional cases filling may be performed with air from compressed air cylinders. The procedure is the same as for filling with azote.

a/ Carrying out of artificial recoil

The hydraulic recoil brake and the recuperator are possessing relatively great finely finished interior surfaces which are subject to deterioration if not in use. The most critical factor causing slow destruction of the material is the corrosive effect of the packings which are dry or have a sour film of fluid on them. During longer idle periods of the weapon, the packings under the effect of the fluid may develop a sour reaction on its surface having very strong corrosive effect, especially at contacting places with the cylinder or the piston rod. By moving of the piston rod and of the floating piston this acidity is being eliminated by bringing fresh fluid film on the packings. This movement in fact is the so called artificial recoiling of the barrel. By artificial recoiling the packings and the recoiling parts are bathed in fluid and thereby the possibility of appearance of corrosion is eliminated, because the fluid destroys the acid created at the sealing places.

The force required for performing artificial recoiling of the barrel are as follows :

- at the start of recoiling, the required force is 500 kg
- at the end of recoiling, the required force is 700 kg

The artificial recoiling of the barrel may be performed manually by the crew or with a recoiling device. The procedure for recoiling the barrel with the Tirfor "MINES" device, is as follows :

if the gas creates pressure
ethylene.

If the gas is used
to extinguishing of the fire
the cylinder contains azote.

Only in some
orders, air may be filled in
exceptional cases filling the
compressed air cylinders. The
filling with azote.

s/ Carrying out

The hydraulic re-
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in use. The most critical factor
of the material is the corrosion
which are dry or have a sour film
longer idle periods of the weapon
effect of the fluid may develop
surface having a roughness
at contact with the fluid.
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- set the weapon in position with the trails spread for about 150 mm,
 - raise the carriage trails and place under the spades a wooden beam approx. 100 mm high.,
 - place the three legged bolts in their seatings in carriage tail so that the points touch the ground,
 - the angle between the spread carriage trails and the three legged bolts a bar with the half-lug is attached to which the recoiling device hook is being attached,
 - to the eyelet on the breechring, the hook of the steel wire cable is attached and the cable is pulled tight,
 - the barrel is given the elevation so that the bore axis is in the extension to the cable used for recoiling,
 - operating the device lever back and forth the barrel is being drawn to the rear. Pulling back of the barrel should be stopped when it is drawn out for 400 mm,
 - the recoiling device short lever is placed in extreme position toward the device hook and the barrel will be released and returned in battery position. The steel wire cable must not be tangled,
 - pulling back of the barrel should be repeated two times more. When adding fluid, the recoiling should be performed with the length of 830 mm.
- In the units artificial recoil should be carried out :
- prior to service firing,
 - after every adding of fluid into the recuperator,
 - every month if no firing with the weapon was performed in the meantime.
- It is obligatory to carry out the arti-

ificial recoil 2-3 times. This is done by attaching a strong rope to the eye on the rear side of the breech-ring and engaging 6-8 men to pull back the barrel. When the barrel reaches its rearmost position, the rope is abruptly released or unhooked.

During the carrying out of the artificial recoil, the function of the semi-automatic mechanism, the hydraulic recoil brake and the pneumatic recuperator should be watched.

B. PROCEDURE FOR BORE SIGHTING

The purpose of the bore sighting operation is to test the alignment of the sights for parallelism with the bore of the gun and to provide the basis for adjustment if the sights are found to be out of alignment. The adjustment described herein are those for which tools and equipment are provided.

For bore sighting the gun should be emplaced on level ground. Prior to bore sighting, the elevating and traversing mechanisms should be checked on smoothness, all troubles corrected and the levelling plate wiped clean. The sighting equipment must be inspected and deficient parts replaced.

C. ADJUSTMENT OF THE GUNNER'S QUADRANT

Carefully wipe the levelling plate. Place the gunner's quadrant parallel to the bore of the gun and center its level by means of the elevating mechanism, then reverse it for 180° . If the bubble remains centered, the instrument is correct. If the bubble is out of center, it should be re-centered by means of the adjustment screw, noting the difference in reading. Half of the difference should be corrected by means of the quadrant adjustment screw and the other half by means of the elevating mechanism.

This procedure should be repeated until the bubble remains centered after turning the quadrant for 180° .

D. ADJUSTMENT OF THE RANGE DRUM

For adjustment of the range drum, keep to the following :

- place the gunner's quadrant on the levelling plate, parallel to the bore of the gun
- using the elevating mechanism, center the bubble of the quadrant level
- place the gunner's quadrant onto the panoramic telescope mount parallel to the angle of site level
- center the bubble of the quadrant level, by turning the range drum spindle
- center the bubble of the angle of site level by turning the micrometer scale of the angle of site device
- turn the gunner's quadrant for 90° and center the bubble of the quadrant level by means of the cross leveling mechanism.

After this operations the reading of the range drum should be :

- the "drum" and the "micrometer" indexes aligned at "zero" on
- the angle of site 3 - 0
- the angle of site level and the cross-level centered.

If this is not the case, then :

- loosen two screws and turn "zero" on the "drum" to match the index
- loosen the screws on the range drum spindle and turn "zero" on the range drum micrometer scale to match the index
- loosen two screws on the angle of site scale and make the line 3 - 0 match the index
- loosen the screw of the angle of site knob and make the line "zero" of the micrometer scale match the index
- if the cross level is not centered, loosen the screws and center the bubble.

E. TESTING THE ZERO POSITION OF THE LINE OF SIGHT

For testing the "zero" position of the line

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of sight, keep to the following :

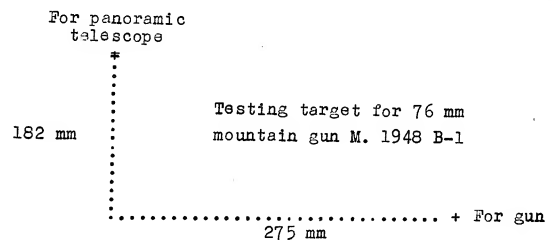
- place the trunnions, using the gunner's quadrant in level position
- stretch cross hairs across the face of the muzzle brake
- remove the firing lock
- bore-sight the gun through the firing pin hole over the cross hairs on the muzzle brake, at an aiming point, at a distance not shorter than 400 meters
- sight with the panoramic telescope on the same aiming point.

After aiming is finished the panoramic telescope should read 32 - 00, the elevation micrometer "0". If this is not case, keep to the following :

- loosen two screws attaching the azimuth scale index and align it with the line "32" on the scale
- loosen the attaching screw of the micrometer and move it until the line "0" matches "0" on the index
- loosen three screws of the elevation micrometer and make scale line "0" match the index.

F. TESTING THE ZERO POSITION OF THE LINE OF SIGHT USING THE TESTING TARGET

If a proper aiming point is not available, testing of the zero position of the line of sight is done by means of the testing target, positioned at a distance of 40 meters in front of the gun, approx. level with the muzzle.



The cleaning rod is being inserted into the bore from the rear.

Prior to cleaning, the barrel should be brought in horizontal position.

Cleaning the barrel in fire position is performed as follows :

- wrap the cleaner in gun grease saturated rag and pass it through the bore two to three times,
- wipe the bore until it becomes dry,
- wrap the cleaning brush in a thin rag saturated in heavy grease,
- insert the cleaner into the bore from the rear and with small movements back and forth pass the cleaning brush through the bore and then pull the cleaner out,
- inspect the bore and if found that some spots are not properly greased, repeat the greasing,
- after 2-3 hours start the cleaning of the barrel. If the situation does not permit cleaning, then remove the grease once more and wipe the barrel thoroughly, but on the following day complete cleaning is obligatory.

The most important part of the barrel cleaning is washing of the bore. The bore should be washed with hot suds or kerosene /in winter/. The suds are made from 5-6 litres of hot water and 50 grams of soap. For washing the bore 1-2 glasses of kerosene are required. Before starting the washing of the barrel, it is necessary to remove the grease and dirtiness, because this will reduce consumption of soap and kerosene. To perform cleaning in this manner, wrap the wooden plug of the cleaner with rags saturated in kerosene and attach it to the cleaning rod and pass it through the bore two times.

For washing the bore it is necessary to :

- remove the breechblock parts,
- insert the plug wrapped in rags into the cartridge seating,

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- remove the muzzle brake,
- give the barrel elevation,
- pour suds or kerosene into the barrel bore through the muzzle,
- wash the bore by rubbing 5-10 minutes with the cleaning brush along the whole length of the barrel bore with the cleaning brush,
- depress the barrel, place under it the shaped sheet iron to prevent the liquid from entering into the barrel mantle and drain the suds /kerosene/ from the bore,
- give the barrel the elevation again, pour one pail of clean hot water into the barrel and with a clean cleaning brush rinse the suds out of the bore and drain the water out of the barrel,
- repeat the washing at least once more if the washing was done with kerosene and least twice if done with suds.

If no suds or kerosene are available, the barrel bore may be washed with clean hot water only of which double quantity should be poured into the bore and the washing must be repeated 5-6 times.

When the barrel is washed the remains of the liquid from its bore should be eliminated as follows:

- the rag should be arranged in form of a band 5-10 cm wide and wrapped around the center of the wooden plug or the cleaner so as to obtain a taper at the point of which this band should end,
- the rag should be sewed or tied with a ribbon,
- insert the plug into the cartridge seating with the taper point forward,
- 6-7 soldiers should take the plug rod and pass it through the bore,
- definitely clean the barrel bore by passing the plug wrapped in felt cloth through the bore 5-6 times.

The felt cloth should be wound around the middle of the wooden plug 3-4 times. The top layer of the cloth would create a cone; to prevent this layer to unwind it should be tied with twine.

The felt cloth winding should be so much that 5-6 soldiers would be able to pass it through the barrel bore; if 3-4 soldiers are able to pull it through it means that the winding is too small and the cleaning of the bore would be poor.

Checking to see whether the barrel bore is clean is done by passing the plug, wrapped in a white rag, through the bore. If the rag gets soiled, the cleaning should be resumed until the check plug comes out of the bore absolutely clean.

By passing through the check plug the condition of the bore surface is being checked and therefore the plug should be pulled out slowly to prevent tearing of the rag. If, during pulling out of the plug the rag tears, an artillery technician should be called.

Partial cleaning of the barrel is performed as follows :

- on command "Prepare for march" the greasing of the barrel bore is performed as herein afore described,
- after 2-3 hours the grease should be removed, the bore washed with kerosene and dried by wiping. Should the situation not permit even this procedure, it is necessary to give the bore dry wiping,
- grease the barrel carefully, with gun grease,
- if the barrel bore gets copperized during firing, this should be removed according to special instructions in the "Repairs" manual.

After cleaning of the barrel, the barrel mantle, the muzzle brake and the breechring with the breechblock are being cleaned.

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Special attention should be given to the contacting surfaces of the barrel with the breechring, the mantle and breech block.

Cleaning of the breechring and the breech-block

For cleaning, the breechring and the breech-block should be completely disassembled. The places having powder soot should be washed with kerosene. All breech-block parts should be put in kerosene or gasoil and the old grease washed off immediately. After rinsing, the parts should be well dried and lubricated.

Any hollow spots or recesses on the breechring, breechblock and its belonging parts should be cleaned by means of a painty stick of soft wood.

Cleaning of the carriage

The carriage is being cleaned from mud and dust with dry rags, and if it is very dirty, the mud should be removed with wooden spades or with straw packs and then washed with water and dried with rags. When washing the water must not enter the traversing and elevating mechanisms, equilibrators and spring devices.

Kerosene or gasoil should not be allowed to get on the tyres.

The mechanisms on the carriage are being disassembled during cleaning only when their function is not smooth and easy. Then it is necessary to remove the old grease and if on some parts the corrosion appeared it should be carefully cleaned.

When removing the wheels, old grease should be changed. Very dirty ball bearings should be washed in suds or kerosene.

The covers are being cleaned from mud and dust, and if very muddy they should be washed in warm suds. The covers should not be dried in the sun and allowed to fall in sand or dust.

When cleaning the remaining parts proceed as follows :

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- remove the dirt and hard grease with hemp waste or rags,
- change the rags until they remain absolutely clean,
- if the parts are neglected to a greater extent, they should be kept in oil 15 minutes before resuming cleaning; for very dirty and less sensitive parts kerosene should be used for cleaning,
- corroded parts on the sighting devices should not be cleaned with kerosene but with charcoal dust,
- excessive rubbing of parts, for the purpose of polishing, is prohibited,
- blackened parts are being cleaned with oil and must not be rubbed too much, because the blackening would come off,
- spots from which the blackening has been removed should be cleaned with oil,
- when the material is dusty, it should be wiped with a moist rag and then with a dry one,
- scraping of mud with hard articles is prohibited.

F. LUBRICATION OF THE GUN AFTER CLEANING

The gun is not being lubricated before it is thoroughly clean.

After inspection, all the contacting surfaces are lubricated and all parts not painted as well. Special care should be given to lubrication of the bore, the breechblock and all component parts.

The NCO's should know by heart the emplacement of all lubricators and all spots undergoing great friction for periodical lubrication /slides/. The bore should be lubricated with a thin layer of lubricant to which purpose an oil soaked rag should be wrapped around the cleaning brush and passed through the bore 4-5 times. Take care to lubricate the groove corners thoroughly. Un-

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der no circumstances should the bore be lubricated with the lubricant containing kerosene.

After disassembling the breech-block and its parts are wiped with a greasy rag. Over-lubricating would make it more difficult for the parts to operate and could result in failures especially in winter at low temperatures.

The carriage of the gun in constant use should be lubricated at least once a week. On the carriage all parts not painted and contacting surfaces should be lubricated. The cradle slides should be given a richer lubrication to which purpose the barrel should be pulled back as much as necessary.

The parts in the traversing and elevating gear housing should be given abundant lubrication.

The range quadrant should be lubricated with spindle oil.

The gun in general should be coated with lubricant only slightly, but if it were to stay out of use for some longer period, the layer of lubricant should be from 0,5 to 1 mm thick.

The days when lubrication has been carried out should be recorded in the unit.

/See lubrication diagram/

To disassemble the gun it is necessary :

- to remove the covers from the breech-ring /crew No. 1 and 2/, and the muzzle /crew No. 5 and 6/
- to spread the carriage trails if they were folded for tandem or motor transport /crew No. 1, 2, 3 and 4/.

NOTE: The numbers in the brackets mean the standard members of the crew.

a - Removing the sighting equipment /if attached to the gun /1/

- 1 - Set the sighting equipment to basic settings :
 - range drum 0, micrometer scale 0
 - angle of site scale 3-00
 - elevating scale 0-0

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- all levels covered
- range drum spindle locked.
- 2 - With the left hand press the range drum, mount clamping screw forward, and with the right hand remove the range quadrant together with the panoramic telescope.
- 3 - Put the range quadrant with the panoramic telescope and the gunner's quadrant into the sighting equipment chest.

b - Removal of the cradle support

- 1 - Move the elevating mechanism slightly to enable the cradle locking pin to be pulled out /6/
- 2 - Pull out the locking pin and release the support /5/
- 3 - Pull out the pin connecting the fork with the support base /6/
- 4 - Unlock /1 and 2/ and pull out /5 and 6/ the support base wedge from the travelling axle
- 5 - Pull down and remove the support base /5 and 6/

c - Removal of the shields

- 1 - Give the barrel depression /1/
- 2 - Lock the equilibrators /1 and 2/
- 3 - Place the barrel in horizontal position /1/
- 4 - Remove the plate between the left and right shields /2/
- 5 - Press down the latches and fold the upper wings /1 and 2/
- 6 - Unlock the shields clamp /2/
- 7 - Release the lower shields from the support /5 and 6/
- 8 - Release the large shield supports /1 and 2/
- 9 - Remove the shields /5 and 6/
- 10 - Release the lower shield latches, fold the support in its upper position and fold the lower shield /5 and 6/
- 11 - For packing, No. 5 carries the left shield to the right side of pack animal No. 8, and No. 6 carries the right shield to the left side of the same pack animal.

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d - Disassembling of the breechblock

- 1 - Unlock the breechblock connector with the hydraulic recoil brake /3/
- 2 - Pull back the breechring /3/ and push back the muzzle brake /4/ for the length of the breechring
- 3 - Open the breechblock /3/
- 4 - Press down the pin locking the barrel in the breechring /3/
- 5 - Turn the breechring to the left /3/ and close the breechblock
- 6 - Lock the connector /3/
- 7 - Carry the breechring /numbers 1, 2, 3 and 4/ to pack animal No. 7.

e - Disassembling of the barrel

- 1 - Release the movable eye of the barrel from the mantle /5/
- 2 - Turn the barrel to the right /5/
- 3 - Pull back the barrel /5/
- 4 - Hold back the barrel while pulling it out /6/
- 5 - Pull the barrel out backwards up to the eye on the front end /5/
- 6 - Carry the barrel to pack animal No. 6 /crew members No. 5, 6, 1 and 2/.

f - Removal of the mantle

- 1 - Turn the recoil length index stop to the right
- 2 - Insert the bars /3, 4, 5 and 6/
- 3 - Carry the mantle to pack animal No. 5 /Nos. 3, 4, 5 and 6/
- 4 - Pull the trigger to the left to enable it to get out of its latchkey with its square end in order to enable the operating cam to be removed
- 5 - Remove the operating cam /2/.

g - Removal of the cradle

To remove the gunners guard :

- 1 - Give the cradle maximum elevation /1/ and disassemble the elevating gear spindle /No. 1/

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- 2 - Unhook the equilibrator steel cables /No.2/
- 3 - Open the cradle trunnion covers /Nos 1 and 2/
- 4 - Lift the front end of the cradle /No.3 and 4/, with bars /No.4/, and grasping the counter recoil piston rod /No.2/ lift up the cradle and put it onto the right wheel
- 5 - Insert the bar /No. 1/
- 6 - Carry the cradle /Nos. 1, 2, 3 and 4/ to pack animal No. 4.

h - Disassembling of the carriage trails

- 1 - Close the cradle trunnion covers /No. 3/
- 2 - Put the steel cables into their seats /No.4/
- 3 - Remove the rear trails, the left one /No.5/ and the right one /No.6/
- 4 - Disassemble the carriage trails, the left one /No.1/ and the right one /No.2/
- 5 - Push down the top carriage, grasping the shield supports to enable the trails to be disassembled /No.3/
- 6 - Remove the front carriage trails, the left one /No.1/ and the right one /No.2/
- 7 - Assemble the front with the rear trail parts and fold them, the left one /No.1/ and the right one /No.2/
- 8 - Carry the right carriage trail /No.2 and 3/ to the left side, the left carriage trail /No.1 and 4/ to the right side of the pack animal No.3.

i - Removal of the wheels

- 1 - Slightly lift the carriage /Nos. 3 and 4/
- 2 - Release the wheels from the axle; the right one /No.6/ the left one /No.5/
- 3 - Remove the wheels, the left one /No.5/, the right one /No.6/
- 4 - Lock the springs /No.5 and 6/
- 5 - Carry the wheels to pack animal No. 2 /crew No.5 and 6/.

j - Removal of the carriage

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- 1 - After removing the other parts of the carriage, the top carriage body with the axle is carried /by Nos.1, 2, 3 and 4/ to pack animal No. 1.

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P A R T IV

TRANSPORTATION OF THE GUN

TRANSPORTATION OF THE GUN ON PACK ANIMALS

1 - Pack animal No. 1 - carrying the carriage

Fig. 2

The carriage is placed onto the pack saddle so that the traversing and elevating mechanisms are on the animals' right side, with the arc racks turned backwards. The pads on the bottom side of the equalizer brace are lying on the braces of the packsaddle, and the pad on the traversing gear housing is lying on the right plug on the cantle of the packsaddle.

The carriage is fastened with four chains, two in front for the equilibrators housings and two on the rear for the reinforcements on the travelling axle.

The harness traces are wound and hung on the cantle of the packsaddle.

The equipment of the horse is packed onto the right and left sides of the packsaddle.

2 - Pack animal No. 2 - carrying the wheels

Fig. 2

The wheels are suspended on the packsaddle on their rings with the springs locked in their lower position.

On top of the packsaddle are packed the shorter harness traces for tandem towing.

The horse equipment is packed on top of the pack saddle.

3 - Pack animal No. 3 - carrying the carriage-trails

Fig. 2

The left trail is suspended on the packsaddle on the right side and the right trail on the left side of the horse. The front parts of the trails are fastened to the packsaddle with leather straps.

On top of the packsaddle is the thill fork

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with the lunette placed so that the fork arms are turned backwards, the lunette resting on the pommel of the pack saddle, attached with one leather strap.

The horse harness is packed on top of the packsaddle.

4 - Pack animal No. 4 - carrying the cradle

Fig. 2

The cradle is packed on top of the packsaddle with the rear ends of the piston rods facing front. The plugs on the pommel and the cantle enter the corresponding seats on the cradle. The slides are turned upwards.

The cradle is attached with four chains, two of them in front of, and two behind the elevating mechanism.

The harness of the horse is packed on the sides of the packsaddle.

5 - Pack animal No. 5 - carrying the mantle

Fig. 2

The mantle is carried on top of the packsaddle, the muzzle brake facing front.

The mantle rests with its slides on the pommel and the cantle, leaving their plugs outside.

The mantle is attached with four chains.

Attached to the right side of the packsaddle, to the frame, are the operating cam, two spades and a bar.

Attached to the frame on the left side of the packsaddle are the hammer, the pick, two bars and the barrel cleaning rod.

The harness of the horse is suspended on the pommel, on the left and the right side of the horse.

6 - Pack animal No. 6 - carrying the barrel

Fig. 2

The barrel is carried on the pommel and the cantle, the rear end facing front. The barrel is

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For transporting the gun in tandem tow two horses are put to the gun one behind the other. Exceptionally the tandem team may consist of three horses.

One horse is put to the gun between the thill arms. The thill arms are attached with their front ends with an arresting strap to the rings on the harness. The thill arms rest on the thill strap passing over the packsaddle under the braces.

To the harness of the thill horse are attached two supports for the traces of the leading horse.

The leading horse is provided with passing traces attached each with one strap to the rings on the packsaddle.

The cradle travelling support fixes the cradle, and the springs are locked.

When the gun is transported in tandem tow, the rear parts of the carriage trails may be removed, thus minimizing the pressure onto the packsaddle of the thill horse. The taller the thill horse the smaller the pressure.

The burden on the thill horse amounts to :

- a - with the carriage trail rear parts assembled...35 kg
- b - with the carriage trail rear parts disassembled 24 kg.

When the carriage trail rear parts with the trail spades are disassembled, they are transported on a pack horse.

d - Automotive transport

Fig. 4

For automotive transport the carriage trails are folded and the gun is attached with a lunette to the hook on the prime mover.

The springs have to be locked.

The cradle travelling support fixes the cradle.

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PART V.TROUBLES ON THE HYDRAULIC RECOIL BRAKE AND PNEUMATIC
RECUPERATOR AND HOW TO ELIMINATE THEM

<u>TROUBLE</u>	<u>CAUSE</u>	<u>HOW TO ELIMINATE</u>
Poor connection of barrel and recoil brake and recuperator.	1. Weak or broken spring of connecting lever with the recoil brake and recuperator.	BATTERY PERSONNEL to replace spring.
Recoil too long.	1. Weak or broken spring of recoil-length index.	BATTERY PERSONNEL to replace spring.
	2. Lack of fluid and azote pressure in recuperator.	BATTERY PERSONNEL to check amount of fluid and azote pressure. Refill if needed.
	3. Lack of fluid in hydraulic recoil brake.	BATTERY PERSONNEL to check amount of fluid and refill if unsatisfactory.
	4. Recoil-length regulator out of adjustment.	BATTERY PERSONNEL to adjust recoil-length regulator.
	5. Too much clearance between piston and recoil brake cylinder.	REGIMENTAL WORKSHOP to check, by gaging, whether the allowed clearance has not been surpassed. DEPOT REPAIR WORKSHOP to re-

TROUBLE	CAUSE	HOW TO ELIMINATE
Recoil too long.	der.	place piston.
	Too much clearance between inner piston and counter recoil piston rod of recoil brake.	REGIMENTAL WORKSHOP to check, by gaging, whether the allowed clearance has not been surpassed. DEPOT REPAIR WORKSHOP to replace piston.
Recoil too short.	1. Too much fluid and azote pressure in recuperator.	BATTERY PERSONNEL to check amount of fluid and azote and to release the surplus.
	2. Recuperator floating piston overtightened.	See repairs book.
	3. Recoil length regulator out of adjustment.	BATTERY PERSONNEL to adjust recoil length by enlarging the opening for passage of more fluid. To achieve this : adjust recoil-length by lengthening the regulator lever with the adjusting nut.
	4. Recoil brake packing overtightened.	BATTERY PERSONNEL to adjust tightening of the packing by loosening the retaining nut. One man should be capable by his own strength to pull out and push in the piston rod.
	5. Dirty and poorly	BATTERY PERSONNEL to

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HOW TO ELIMINATE	CAUSE	TROUBLE
Place piston in REGIMENTAL WORKSHOP to check, or bring, whether the allowed clearance has not been surpassed.	Too much clearance between piston and cylinder for action rod of a coil spring.	Recoil too short.
BATTERY PERSONNEL to check amount of fluid and add to release the machine.	1. Too much fluid and azote pressure in the recuperator.	Recoil too short.
See repairs book.	2. Recoil spring floating piston over the piston.	Recoil too short.
BATTERY PERSONNEL to adjust recoil length by enlarging the opening for passage of more fluid. To achieve this adjust recoil length by lengthening the regulator lever with the adjusting nut.	3. Recoil length regulated out of adjustment.	Recoil too short.
BATTERY PERSONNEL to adjust tightening of the packing by loosening the retaining nut. One man should be capable by his own strength to pull out and push in the piston rod.	4. Recoil brake packing over-tightened.	Recoil too short.
BATTERY PERSONNEL to	5. Dirty and poorly	Recoil too short.

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TROUBLE	CAUSE	HOW TO ELIMINATE
Recoil too short	lubricated slide on the cradle.	clean and lubricate the slides.
	6. Slide jammed, residues of brass.	See repairs book.
	7. Minor injuries and incisions on the cradle.	BATTERY PERSONNEL to file off uneven spots around the injuries and incisions.
	8. Injuries and incisions with deformations of cradle slide.	See repairs book.
Counter recoil not completely effected /too short/	1. Insufficient fluid and lack of azote pressure in recuperator.	BATTERY PERSONNEL to check quantity of fluid and azote pressure, refill and test counter-recoil of barrel by artificial recoil.
	2. Recuperator floating piston over-tightened.	REGIMENTAL WORKSHOP to adjust the tightening of the floating piston.
	3. Speed of counter-recoil regulator out of adjustment.	BATTERY PERSONNEL to test operation of counter-recoil speed regulator by means of artificial recoil and adjust to normal return in battery
	4. Recoil brake packing overtightened.	BATTERY PERSONNEL see para 4 under "recoil too short"
	5. In the cradle.	BATTERY PERSONNEL see paras 5, 6 and 7 under

TROUBLE	CAUSE	HOW TO ELIMINATE
Counter recoil not completely effected /too short/		"recoil too short"
	6. Clogged holes on counter-recoil speed regulator.	See repairs book
	7. Presence of azote in compensator.	BATTERY PERSONNEL to elevate barrel over 10°, unscrew valve for refilling brake fluid, close valve the very moment fluid begins to overflow
	8. Difficult operation, jammed parts of firing mechanism and cocker /hammer, sear, trigger lug/	The mentioned troubles cause great friction, augmenting friction between operating cam and the operating shaft, as a result of which the barrel is blocked on the operating cam. Disassemble breech-block, carefully inspect parts /sear, hammer, trigger lug/ and their springs. With a fine file smoothen out the jammed surfaces, replace with spares if necessary.
Counter recoil with shocks	1. Bent recuperator piston rod.	See repairs book.
	2. Bent recoil	See repairs book.

TROUBLE	CAUSE	HOW TO ELIMINATE
Counter recoil with shocks	broke piston rod and counter piston rod.	
	3. In the cradle.	BATTERY PERSONNEL see paras 5, 6 and 7 "recoil too short"
Counter recoil too violent.	1. Fluid and azote pressure in recuperator in excess.	Check quantity of fluid and azote. Release surplus fluid and azote.
	2. Counterrecoil speed regulator out of adjustment.	BATTERY PERSONNEL see para 2 "counter-recoil not complete"
	3. Fluid and azote getting mixed in recuperator.	See Repairs book.
	4. Lack of fluid in recoil brake.	BATTERY PERSONNEL to check quantity of fluid and refill.
	5. Increased clearance between piston and recoil cylinder.	See repairs book.
	6. Increased clearance between inner walls of piston rod and counter piston rod.	See repairs book.
	7. Increased clearance between counter recoil shock absorber and brass bushing.	See repairs book.
	8. Worn out rubber pad.	REGIMENTAL WORKSHOP to replace the rubber pad.

TROUBLE	CAUSE	HOW TO ELIMINATE
Counter recoil with shocks	brake piston rod and counter piston rod.	
	3. In the cradle.	BATTERY PERSONNEL see paras 5, 6 and 7 "recoil too short"
Counter recoil too violent.	1. Fluid and azote pressure in recuperator in excess.	Check quantity of fluid and azote. Release surplus fluid and azote.
	2. Counterrecoil speed regulator out of adjustment.	BATTERY PERSONNEL see para 2 "counter-recoil not complete"
	3. Fluid and azote getting mixed in recuperator.	See Repairs book.
	4. Lack of fluid in recoil brake.	BATTERY PERSONNEL to check quantity of fluid and refill.
	5. Increased clearance between piston and recoil cylinder.	See repairs book.
	6. Increased clearance between inner walls of piston rod and counter piston rod.	See repairs book.
	7. Increased clearance between counter recoil shock absorber and brass bushing.	See repairs book.
	8. Worn out rubber pad.	REGIMENTAL WORKSHOP to replace the rubber pad.

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TROUBLE	CAUSE	HOW TO ELIMINATE
	tor piston.	
	4. Fluid leakage around sealing plug.	BATTERY PERSONNEL to replace gaskets.

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PART VI.

SPECIAL REMARKS

I.

Emplacing the gun from motor and tandem tow transport position to firing position.

1. When unscrewing the carriage trail traveling lock connection from the right trail, it is necessary to pull carefully the handle of the attaching lug and by no means return it by force.

2. When spreading the carriage trails take care to separate the rear parts of the trail from the front parts; do not lift them until correctly unlocked. The same care should be taken when assembling the trails for firing position.

3. When spreading the trails for emplacing the gun to firing position, it is necessary to attach the trails to the sides of the equalisers with locking pins, which should be slightly turned until completely locking the trails. In case they would not move easily, it is necessary to adjust them by moving the trails to the left and right; in case this should not prove successful, one man of the crew should press the muzzle brake up or down, in which case the trails must get fixed.

II.

During firing.

1. If the recoil lengths do not correspond to the table on the gun, it is necessary to check whether the recoil-length regulator is properly assembled. In doing this it is necessary to bring the gun in horizontal position and prove whether the indexes of the parts of the regulator match each other.

2. Check the recoil length index pointer stop to see whether it has not got out of its firing position because by getting out of the firing position the index

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ACTION ON COMMAND "UNHOOK"

If the gun is towed by mechanised prime mover, the gun commander commands "unhook".

Following this command, the leader No. 3 unlocks the lunette of the prime mover, whilst the fuze setter No. 4 pulls out the locking pin of the prime mover. Crew members No. 1, 2, 5 and 6 unload the tools and ammunition from the prime mover.

ACTION ON COMMAND "PUT OUT"

If the gun has been transported in tandem, the gun commander commands "put out".

Following this command the gunner No. 1 unhooks the right harness trace and hangs it over the packsaddle, the assistant gunner No. 2 unhooks the left harness trace and hangs it over the packsaddle, the leader No. 3 unties the thill holders on the left side of the horse, the fuze setter No. 4 unties the thill holders on the right side, and pulls out the thill attaching pin, and No. 6 stands between the thill arms, holding them up, while the horse is put out, pulls out the thill and carries it to the right side of the gun.

NOTE : Unhooking and putting out are preliminary actions to preparing the gun for firing.

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P A R T VII.

INSPECTIONS

76 mm Mountain gun M-48 /B-1/; B-1A1-I; B-1A2/

Duration of the weapon and its readiness for combat depend on proper handling maintenance and careful preparation for firing. For this reason the inspection rules should be fully carried out.

Daily inspection

a/ Inspection prior to use

The platoon Commander with the gun crew inspects the weapon.

The inspection includes :

- a/ completeness of the gun, and
- b/ condition of the weapon.

For the purpose of completeness inspect : the covers, the stakes, the cleaners, the spades, the sighting devices and other sets.

For inspection place the weapon in combat position.

1. Open the breechblock and make sure the gun is not loaded.
2. Inspect the barrel connection with the piston rod extension.
3. Give the barrel its highest elevation and make sure that there is pressure in the recuperator. When working, stand on the side of the gun and observe the work of the whole elevating mechanism. With this the functioning of the equilibrator is checked. Observe also the work of the steel wire cables.

4. Check the whole traversing mechanism.

5. Check the connection of the cradle with the carriage.

6. Try the connecting and disconnecting of the spring devices and see if the fixing bolts of the spring device stand properly on the axle.

7. Check the fixing of the carriage trails.

8. Check the wheels by turning and pressing. The wheels having solid semi-elastic rubber tyres type B-1A2 check to see that the rubber is stuck to the metal.

9. Check to see whether the carriage bracket support is well connected with axle and that the moving portion of the bracket is tight, that it rigidly supports the cradle.

10. Check the condition of the lunette. That the spring is in good order and that the bolts with chains are there.

11. Check the carriage trails connection with the connector and its joint with the towing connector.

12. Inspect the thills, its joint with the tow connector or the lunette connection with limber hook or with the towing vehicle hook and the method of fixing during march according to applied transport method.

13. Inspect to see whether the shields are interconnected and that the shields supports and brackets are secured and that the shields wings are connected with the shields by means of latches.

14. Make sure all fasteners, cotter pins, wire safety elements on the valves, nuts and screws are in good state.

15. For pack animal transport, inspect load seatings on the pack-saddle and the load fixing hooks.

16. After preparation is finished, the battery Commander checks the preparations by making the round of the battery.

b/ Inspection during march, short stops and rests

The inspection is done by the platoon Commander, squad leader and the gun crew :

- during march by observing the weapon for the purpose of timely detection of eventual defects,

- during short stops and rests inspect :

1. The hubs to see that they are not overheated.
2. The semi-axle for grease leakage.
3. The spring devices.
4. Connections secured bolts, cotter pins and wire.
5. The cradle bracket.
6. Thills connection with the towing hook.
7. The barrel and cradle connection.
8. Leakage of fluid from the recoil brake and from the recuperator.
9. The tyres and if there are signs of loss of air pump them up to 1.8 atms.
10. Pay attention to the travelling speed in various weather and terrain conditions having in mind the type of wheels.

c/ Inspection of weapons after use

The inspection is being performed by the platoon Commander.

- Clean the weapon and the accessories from dust or mud with a rag and lubricate the surfaces which are not painted. The scope of cleaning will depend on the weather conditions under which the weapon was used. This is related to cases when no firing was performed with the weapon.

- Place the weapon and the accessories at the selected place.

d/ Inspection of weapons prior to use

The inspection is being performed by the battery Commander with his subordinate personnel.

Place the weapon in combat position on nearly level and hard base. If such commodity is not available in the open area, the preparation may be made

in a clean and light room.

Inspect :

1. The completeness of the weapon : the covers, the stakes, the cleaners, the spades, completeness of sighting devices, weapon and battery sets.

2. The barrel. Open the breechblock and make sure that the gun is not loaded and clean it from grease. Keep passing the cleaner through the bore until all traces of dirt on the rag disappear. Inspect the barrel bore and make sure there are no scratches, injured lands, greater copper accumulations, charred spots, corrosion and finally measure the powder chamber depth. The measuring of the powder chamber depth, i.e. the forcing cone should be done as shown in figure with the depth measuring device or with a ruler. To do this it is necessary to :

- remove the fuze from the shell,
- take out the shell of the cartridge case,
- take out the propellant charge,
- unscrew the artillery primer from the cartridge case,
- place the shell into the bore and ram it with the rammer,
- place the cartridge case into its seating so that it leans on the barrel with its rim,
- measure the depth from the shell to the cartridge case head with the depth measuring device or with the ruler,

The forcing cone of the shell should be recorded in the weapon log book.

According to the tables determine the muzzle velocity percentage fall. Lubricate the barrel; with a cracked barrel or with a barrel with the reduced muzzle velocity of 10% firing is prohibited. After every 1000 rounds fired, measure the diameter of the caliber and grooves with the barrel bore gauge in horizontal and vertical positions.

3. The barrel mantle. Inspect the exterior and make sure there are no major dents. The sliders should be carefully checked.

4. The muzzle brake. Make sure it is screwed on good, secured and that there are no cracks. The exterior of the muzzle brake must not be dented. If the disks of the muzzle brake are bent so much that the projectile passage diameter has been reduced, then the muzzle brake should be sent for repairs.

5. The breechblock and the semi-automatic. Make sure the breechblock is properly functioning by opening and triggering it. When closing the breechblock the roller on the trigger must not touch the horizontal surface of the pusher on the cam casing. If there is no spacing at this place, self firing may occur when closing the breechblock. Place an empty cartridge case into the barrel, free the barrel from its connection with the piston rod extension and check the work of the semi-automatic and the breechblock.

6. The traversing and elevating mechanism. By turning the mechanism wheel, make sure the running is easy and without interruptions. During checking of the elevating mechanism observe the behaviour of the steel wire rope, the guide and the work of the equilibrators.

7. Remove the barrel with the breechring and the mantle.

8. The breechblock. Disassemble, clean and examine all parts according to groups.

9. The cradle. Examine to see whether the cradle is properly sitting on the carriage and that the cradle cover and shoulders may be properly fixed. Inspect the sliders and make sure they are not injured. Check the stuffing box for leakage of fluid. Check the valves, the recoil length speed regulator and the recuperation speed regulator. Inspect the cradle protecting casing and the cams.

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10. The carriage. Check the connections of all parts and the fasteners. Inspect the cradle shoulders and the recoil index,

- make sure that the carriage trails are properly connected and fastened with the equalizer parts,
- the carriage axle when struck with a hammer must give a clear sound,
- check the connecting and disconnecting of spring devices,
- check the wheels by turning and pressing.

11. Check all the safety elements, lugs and hooks for transport and towing.

12. All defective parts available in the weapon set of spares, tools and accessories, should be replaced.

13. Grease and assemble the barrel and the breechblock and the sliding surfaces.

14. Check the fluid and pressure.

15. Perform artificial recoiling of the barrel. Observe the condition of the piston rod, the behaviour of the valve sealing and the method of recuperation.

16. Rectify the sighting devices.

17. Inspect the harnessing equipment.

e/ Inspection of weapons during firing

The inspection is being performed by the squad leader and the gun crew.

1. For each round fired observe the recoil length and the barrel recuperation. Check the index during recoil.

2. Check the indicator of fluid in the recuperator.

3. Check the barrel connection with the piston rods.

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4. Observe to see if the seals and valves are leaking.
5. Clean the barrel with the brush dipped in gun oil.
6. Observe to see that safety elements of the connection have not loosened owing to firing and that some of the parts are not broken.

Inspection of weapons after firing

The inspection is being performed by the battery Commander.

1. After firing, while the barrel is still warm, wipe the barrel bore from soot and grease.
2. Two to three hours after firing perform the barrel cleaning and pass through the control plug.
3. Inspect the barrel and grease it.
4. Repeat the cleaning in the course of the following two days, once each day.
5. Inspect the connecting elements of the barrel with the cradle.
6. Check the completeness of the accessories and the spares set.
7. Check the sighting devices.
8. Place the weapon and the accessories at the place foreseen for this.

Weekly Inspection

The inspection is being performed by the battery Commander with the men in his battery.

The artillery division Commander must attend every second weekly inspection.

The inspection includes the conditions of weapons and spares, tools and accessories sets, the books of weekly inspections and the capability of the crew in maintenance of weapons.

1. Place the weapon in combat position.
2. Clean the barrel and inspect the bore to see whether it is in good order, that the grooves and

lands are not injured, that the bore has not corroded, charred or spotty.

3. The breechblock and the semi-automatic. Try the functioning of the breechblock. Disconnect the barrel and the piston rod connector and check the working of the semi-automatic.

4. The traversing and elevating mechanisms. Try the mechanisms to see whether they are working easily and uniformly. Check the steel wire rope and the equilibrator.

5. Remove the breechblock, the barrel and the barrel mantle.

6. Inspect the exterior of the barrel. Remove the mantle together with the muzzle brake and clean and lubricate the sliders and the other sliding surfaces in the mantle. Disassemble the breechblock on part groups and clean.

7. Clean the cradle slides and check their condition. Inspect the seals and valves.

8. The carriage : Inspect the trails, spring devices and the wheels.

9. Clean well all the machined surfaces and replace all damaged parts which are available in the spares set.

10. Grease all machined surfaces and assemble.

11. Check the completeness of the spares, tools and accessories set.

12. Inspect the sighting devices, clean them and lubricate the machined surfaces. Check the lighting equipment.

13. Check the loading and harnessing equipment.

14. Enter the found condition in the "Weekly Inspection" book and sign.

15. Check whether the weapon condition conforms to the data in the weapon log book and whether the weapon log book is properly and regularly kept.

I. Technical Inspection

This inspection is being performed by the technical platoon-squad of the regiment in the presence of the battery Commander, the artillery division Commander and the subordinate personnel. The gun crew cleans the weapon and prepares it for inspection.

The inspection includes the complete weapon with its set of spares, tools and accessories and the documentation.

The inspection includes the weapons in service and in War Reserve once per month.

Inspection of weapons in service

Place the weapon in combat position, open the breechblock, make sure the barrel is empty, then check the connection of the barrel with the cradle and give the barrel the elevation to check the pressure; remove the shields.

Check all the weapon mechanisms in the assembled state by trying their functioning. By visual inspection establish the connections state of various safety elements and valves. When a general picture of the technical condition of the weapon is obtained, proceed with detailed inspection of individual mechanisms and parts of the weapon.

1. The barrel: Clean the barrel with hemp and rags. At the end pass the control plug through the bore several times until all traces of dirt and moisture disappear from the rag. Illuminate the barrel bore with a bulb or by lighting a paper and make sure that the lands and grooves are not injured, corroded or copperized. Inspect the powder chamber and the cone to see that they are not charred and that there is no traces of cracking on the cone.

- Check the extension of the powder chamber owing to corrosion in the cone. According to tables determine the fall of muzzle velocity percent and enter this

data into the weapon log book. Muzzle velocity fall of 10% de-classifies the barrel.

2. Breechblock and semi-automatic: By checking of opening and closing by hand make sure the group parts for opening and closing are in proper state. By triggering and checking the firing pin point make sure the triggering and firing parts are in good condition. Disconnect the barrel connector from the cradle and check the semi-automatic. At the same time check the functioning of the extractor; for this it is necessary to put an empty cartridge case into the barrel. Open the connector.

3. Traversing and elevating mechanisms: By turning the mechanism wheel make sure of easy operation of the mechanism without interruptions. When proving the elevating mechanism check the steelwire cables and the operation of the equilibrators. Eliminate plays in the wheel over 1/4 turn.

4. Remove the breechblock, the barrel, the breechring and the barrel mantle. By disassembling check the connection of the barrel, breechring and the barrel mantle. Inspect the muzzle brake and how it is fastened in the mantle. Examine the barrel mantle outside and make sure the slides are in order.

Disassemble and clean the breechblock and the semi-automatic. Replace the damaged parts and grease slightly and assemble again.

5. The cradle: Clean the slides and inspect. Examine the cradle shoulders seatings, the condition of the sealings and valves.

Examine the recoil length regulator and the toothed arc rack.

6. The carriage: Inspect the connection of all parts and how they are fastened. Examine the carriage axle and the spring devices. Look over the wheels and all fasteners for loading and towing.

7. Disassemble the carriage in loading assemblies, clean the working and surfaces which are

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painted and grease. Lubricate all lubricating cups.

8. Assemble and perform artificial recoil of the barrel. If there are signs that the fluid leaked and that the pressure is reduced, then make a check. Check the fluid with methyl-violet paper.

- Check the condition and completeness of the weapon spares, tools and accessories set,
- Clean and inspect the optics of the sighting devices,
- Eliminate the plays in the sighting device mechanisms,
- Check the lighting equipment,
- Enter in the I technical inspection report form TS-4 all results according to assemblies.

Weapons in War Reserve

The purpose of the inspection is to check : the completeness of the weapon, the preservation and to prevent sticking of jointings performing artificial recoil of the barrel. During recoiling check the piston rods for corrosion. The inspection is performed by the technical platoon-squad under the supervision of the battery and artillery division Commanders.

II. Technical Inspection

This inspection is being performed once yearly on all weapons in service and in War Reserve. The inspection is done by the technical platoon-squad and the preparation and cleaning is done by the personnel of the unit to which the weapons belong. The checking is as by I. Technical inspection.

The inspection includes all performances of the I. Technical inspection and in addition also the following :

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Weapons in service

1. The quantity check of fluid and quality state by methyl-violet paper test and chemically on logs of the weapons.
2. Check of pressure in the recuperator.
3. Forcing out the old and forcing in fresh lubricant into assemblies through the lubricating cups and lubricating places.
4. Removing, disassembling, inspection, repairing and lubricating of wheels.

On weapons in War Reserve, besides the above perform :

De-preservation and preservation of the barrel and the breechblock.

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LUBRICATION DIAGRAM

of the Mountain Gun 76 mm M-48 B-1; B-1A2 and B-1A1-I
/Fig. /

The lubrication time intervals are based on the using condition. The time intervals should be shortened under conditions of great dust, sand, heat and humidity. The time intervals for lubrication may be prolonged when the material is not in use provided the storage conditions are satisfactory.

Prior to application of lubricants the lubricators should be cleaned. The lubrication should be carried out after washing and drying.

The joints and connections, wheel hand-grips fixing and locking bolts, carriage trails lock, equilibrator bushings, recoil length indicator, etc., should be lubricated with gun oil daily.

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Figure pos.No.	Part for lubrication	Means	Time inter- val	Remarks
1	Barrel bore	GO	D	Bore should be cleaned-lubricated every day and after cleaning after firing.
2	Barrel exterior	GO	W	Clean and oil slightly.
3	Breechblock with its parts	GO	D	Clean and oil daily and after firing.
4	Interior of the semi-automatic	GG	6M	Done by artillery mechanic.
5	Barrel mantle sliders	GO	2W	Prior to firing obligatory.
6	Cradle shoulder bearings	GG	2W	Every three months remove the cradle and clean the bearings.
7	Toothed rack-traversing mechanism	GG	D	Clean and lubricate.
8	Elevating mechanism screw	GG	2W	
9	Elevating mech. toothed rack and shaft bearings	GO	D	
10	Elevating mech. worm wheel box with worm screw	GG	3M	Lightly at dis- assembling done by the artillery mechanic.
11	Traversing mechanism worm screw box	GG	6M	Lightly at dis- assembling, done by the art. mechanic.
12	Spring device bearings	GG	2W	Also prior to long march.
13	Spring device box	GG	6M	Disassemble, clean and grease and assemble.
14	Wheel hub	GG	6M	Remove wheel and clean old grease,
15	Interior of equalizer	GG	6M	Done by artillery mechanic.

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Figure pos.No	Part for lubrication	Means	Time inter- vals	Remarks
16	Trails connectors	GG	2W	
17	Trails connecting bolts bearings	GG	2W	
18	Trails lock	GG	2W	
19	Lunette interior	GG	6M	
20	Balance joints	GG	2W	
21	Carriage pivot	GG	2W	
22	Recoil length regu- lator gears	GG	3M	Clean and grease lightly
23.	Recuperator cylinder front portion.	GG	6M	Remove front cover.
24	Range quadrant seating	GO	D	
25	Hydraulic recoil brake and recuperator	Steel MM	D	Check the fluid daily and prior to firing.

LEGEND :

GG = Gun grease

GO = Gun oil

Steel MM = Hydraulic fluid

D = Daily

W = Weekly

M = Monthly

3 M = Every three months

6 M = Every six months.

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PART VIII
AMMUNITION

1. Authorized rounds

a. The round with high explosive shell HE CF-350 and HE M55 is semifixed standard round for the 76 mm mountain gun M 1948 B-1 and all parts of the round are analyzed accordingly.

The round is provided with 5 gr of alloy reducing the accumulation of copper in the bore.

There are two types of packing. The old one with three rounds with HE shell CF-350 packed in a wooden box. The fuze is packed separately in a tin.

The new type of packing contains three rounds with HE shell M55, each in a fiber container, all packed together in a metal box.

b. The round with high explosive, antitank shell HE, AT M50 is a fixed round.

There are also two types of packing. The old packing comprises three rounds, and the new packing contains two rounds.

2. SIGNS

a. High explosive shell HE CF-350 /Fig.68 and 69/ is of forged steel. The shell is loaded with trinitrotoluene /TNT/. This shell is provided for personal targets at all ranges.

The K T M - 1, point detonating / P D / fuze is packed in the same case, but separately from the shell. The shell is painted gray.

b. High explosive anti-tank shell H E, A T M50 /Fig.70/ is loaded with hollow charge of trinitrotoluene

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and hexogen / T N P and R D X /. This shell is provided for engaging heavy tanks in direct firing up to 500 meters, exceptionally up to 1000 meters. In emergency, for greater ranges the firing tables for the propelling charge No.3 should be used.

The K - 451, point detonating / P D / fuze is packed in the same case, but separately from the shell.

c. High explosive shell M55 /Fig.71/ is equipped with the fuze PD 15145. The fuze is constantly screwed in the shell.

3. FUZZES

a. The KM-1, PD /Fig.75/ fuze is designed for use with high explosive shell OF-350. The fuze may be set for SUPER-QUICK - with the cap off, and DELAY action - with the cap on. The fuze is packed in the same case, but separately from the shell.

The fuze is automatically armed in the bore, after the round is fired, and is activated when hitting an object.

b. The K - 451, P D /Fig.81/ fuze is designed for use with high explosive anti-tank shell. This is a SUPERQUICK fuze. The fuze is packed separately from the shell, in the same case.

c. The fuze PD M5145 /Fig.73/ is designed for the shell M55.

THE FUZE KM-1

The fuze KM-1 /Fig.76/ is a point detonating fuze designed for the H E shell with two settings - one for superquick, without cap, and the other for delayed action, with cap.

The fuze is packed in the same case with the shells but not screwed on them and is provided with a protecting cap. Therefore, for delayed action there is no need for setting the fuze. The setting of the fuze for

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instantaneous action is carried out by unscrewing the cap prior to loading.

The fuze consists of: the body /3/, the head /2/, the firing head, and the booster /13/.

The firing head consists of the percussion striker /21/ with the firing pin /19/, the inertia striker/8/ with the primer /18/.

In order to prevent the firing pin /19/ from contacting the primer /18/ the firing pin is provided with a spring designed to separate the firing pin from the primer.

The inertia striker is provided with a spring designed to separate the firing pin from the primer. The inertia striker is provided with a safety sleeve /17/, a sleeve /7/, and a spring /6/.

Attached with a locking ring to the bottom end of the fuze head is the counter-star /4/ designed for keeping the inertia striker from moving forward, in order to prevent the primer from being struck by the pin during the flight of the shell.

On its bottom end the inertia striker is provided with a plug which in the very moment of firing, during the start of the shell, presses onto the seal ring /16/, thus preventing the flame from passing to the detonating primer, in case that the firing pin should have struck the primer during the start of the shell or when handling the fuze.

Screwed into the bottom part of the fuze is the booster cap /12/ with the booster /13/ and the detonator /10/.

The fuze is provided with a protecting cap /1/.

THE ACTION OF THE FUZE /Fig. 77-80/

a. In the moment of firing /Fig. 77/

In the moment the gun is fired, the firing pin head /21/ compresses by inertia the spring /20/. The firing pin moves backwards until the firing pin head rests

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against the ring shaped retainer in the fuze head. At this moment the point of the firing pin is 3 mm distant from the primer cap.

At the same moment the striker /8/ owing to inertia compresses the seal ring /16/ thus preventing the flame, in case of premature striking the primer, from reaching the detonator /10/. At the same time the sleeve /7/ overcomes by inertia the sleeve spring /6/ and the safety sleeve /17/ this latter entering with its arms the striker thus reaching the upper surface of the sleeve.

After the shell has left the barrel, the power of inertia ceases, the firing pin returns to its original position, the firing pin head resting against the closing disk.

The ceasing of the power of inertia enables the sleeve spring to return the sleeve to its original position, the striker resting with its upper against the counter-star /4/, thus permitting the flame from the primer to reach the detonator.

b. DURING THE FLIGHT OF THE SHELL
/Fig.77/

The primer is protected by the counter-star from being struck while the firing pin is protected by a closing disk from air pressure so that the firing pin would not move backwards.

When firing with the protecting cap on
/Fig.78 and 79/

When the shell hits the target, the firing pin does not move, but the striker /8/ with the primer /18/ owing to the shell's abrupt losing of speed is carried forward, smashes the counter-star /4/ and the primer is struck by the firing pin, the flame being transmitted to the detonator /10/ provoking the explosion of the booster which in turn leads to the explosion of the shell. In this case the action of the fuze is a delayed one.

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lower extremity of the recess, across the superquick passage.

Safety device. Bore-safe superquick action is provided by arrangement of mechanism within the booster.

Functioning. No action takes place in the fuze upon firing until sufficient rotational speed has been established to overcome the resistance of springs and set-back force on the several safety devices. When set for superquick action, after the projectile leaves the muzzle of the weapon centrifugal force causes the plunger /S/ to move outward opening the passage. At the same time, the plunger pins /V/ locking the delay assembly in unarmed position also move outward, releasing that assembly in preparation for impact. The plunger pin lock /P/ then swings on its pivot under centrifugal force, placing an arm against the inner end of each plunger pin and thereby preventing the return of the pins to the unarmed position. Upon impact, the firing pin of the superquick action is driven against the detonator, initiating the superquick action. Inertia causes the delay action plunger to move forward, driving the primer against the delay action firing pin and initiating the delay action. In normal functioning with superquick action, the delay action has no effect since the superquick train will have caused the shell to explode before the delay train can burn for its prescribed time. However, should the superquick action fail, the shell will function with delay action rather than become a dud. When set for delay action, the plunger which interrupts the superquick passage is restrained from moving. Upon impact, the superquick firing pin and detonator function but the effect is prevented from being transmitted to the shell.

Preparation for firing. The fuze need be adjusted only for the desired action, as described above. The setting can be adjusted at will, prior to firing, with a screw driver or fuze wrench M18. The adjustment can be made in the dark by noting the position of the slot,

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parallel to the fuze axis /or within 15° either side/for superquick /S/ action and at right angles thereto /or within 15° either side/ for delay /"DELAY"/ action.

BOOSTER

The booster /fig.83/ is made up of two major parts: a booster cup /H/ which contains a tetryl booster charge /C/ and screws onto a threaded brass /A/ containing tetryl booster lead /L/, and a rotor assembly. The rotor assembly is made up of a rotor /H/ containing a lead azido-tetryl flash initiated detonator /G/, a centrifugally actuated pin /M/, a centrifugal pin lock pin /T/, which operates under setback, a rotor stop pin /F/ a rotor lock pin /I/, and a rotor lock pin lock /J/. The rotor is seated on its pivot pin /L/ so that the detonator normally is out of alignment with other explosive elements in the booster and the assembled fuze. The center of gravity of the rotor assembly is off the centerline of the pivot center so that the assembly will rotate under centrifugal force. The rotor is locked in the unarmed position prior to firing by the spring-held centrifugal pin. The centrifugal pin, in turn, is held in the locking position by the centrifugal pin lock pin. The function of the rotor stop pin is to stop the rotor assembly when it has rotated to aligned or armed position. The boresafety mechanism is covered at the forward end of the booster by a thin brass cover /D/ which has a flash hole to permit the transmission of the fuze action to the detonator in the rotor of the booster. The flash hole is covered by a thin disk of onionskin paper /E/ to prevent foreign matter from entering the booster.

Functioning. Upon firing, setback forces the centrifugal pin lock pin rearward against its spring freeing the centrifugal pin. Centrifugal force moves the forward end of the lock pin under the shoulder in the lock pin cavity. This prevents the lock pin from returning to its original position. When the projectile reaches the required rotational velocity, the centrifugal

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parallel to the fuze axis /or within 15° either side/for superquick /S/ action and at right angles thereto /or within 15° either side/ for delay /"DELAY"/ action.

BOOSTER

The booster /fig.83/ is made up of two major parts: a booster cup /M/ which contains a tetryl booster charge /G/ and screws onto a threaded brass /A/ containing tetryl booster lead /K/, and a rotor assembly. The rotor assembly is made up of a rotor /H/ containing a lead azide-tetryl flash initiated detonator /G/, a centrifugally actuated pin /L/, a centrifugal pin lock pin /P/, which operates under setback, a rotor stop pin /F/ a rotor lock pin /I/, and a rotor lock pin lock /J/. The rotor is seated on its pivot pin /M/ so that the detonator normally is out of alignment with other explosive elements in the booster and the assembled fuze. The center of gravity of the rotor assembly is off the centerline of the pivot center so that the assembly will rotate under centrifugal force. The rotor is locked in the unarmed position prior to firing by the spring-held centrifugal pin. The centrifugal pin, in turn is held in the locking position by the centrifugal pin lock pin. The function of the rotor stop pin is to stop the rotor assembly when it has rotated to aligned or armed position. The boresafety mechanism is covered at the forward end of the booster by a thin brass cover /D/ which has a flash hole to permit the transmission of the fuze action to the detonator in the rotor of the booster. The flash hole is covered by a thin disk of onionskin paper /E/ to prevent foreign matter from entering the booster.

Functioning. Upon firing, setback forces the centrifugal pin lock pin rearward against its spring freeing the centrifugal pin. Centrifugal force moves the forward end of the lock pin under the shoulder in the lock pin cavity. This prevents the lock pin from returning to its original position. When the projectile reaches the required rotational velocity, the centrifugal

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pin moves outward against its spring. This releases the rotor which then rotates to the aligned or armed position against the stop pin, where-upon the rotor lock pin moves radially outward under centrifugal force from its cavity in the rotor partially and into the hole in the booster body. Creep force causes the rotor lock pin lock to move axially forward into the space behind the rotor lock pin preventing the rotor lock pin from returning to its original position. Thus, the booster is locked in the armed position throughout the flight of the projectile. Action of the booster detonator is initiated by the detonating elements, or magazine charge /in time fuzes/, of the fuze. Explosion of this detonator is transmitted through the booster lead to the booster charge. The booster charge, in turn detonates the high-explosive charge of the projectile.

4. PROPPELLING CHARGES

a. The propelling charges for the HE round /Fig.72/ are divided into sections to provide for four zone firing.

The propelling charge consists of a basic charge and three increments /all of them of the same weight/. The basic charge plus two increments /together forming propelling charge No.3 /are situated in the cartridge case. A certain number of fourth increments is carried separately in sealed containers.

For firing with the propelling charge No.3, no preparing of the cartridge case is required.

When firing with propelling charge No.2 or No.1, it is necessary to remove from the cartridge case one or two increments, respectively. When firing with propelling charge No.4, it is necessary to add into the cartridge case one more increment.

After removing or adding increments the plug must be reinstalled into its seat.

The gun should not be fired with the propelling

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charge No.4 at ranges shorter than 5,700 meters.

b, The propelling charge for the HE, AT M50 is fixed and situated in the cartridge case. For firing this shell with this propelling charge the range drum is used in the same way as for the propelling charge No.3 of the HE round.

Note: The weight of the propelling charge depends on the serial number of the powder.

5. STAMPING AND MARKING OF THE AMMUNITION /Fig.72/

The projectile, the fuze and the cartridge case are bearing stamped identification markings. These marks show production data, the manufacturer, the material the year of manufacture and inspection marks for the production of the respective part.

On the projectiles after painting, on the cartridge cases and increments markings are made in paint showing numbers and letters. These markings are designed to provide the user with the necessary data, as well as for sorting out the ammunition on the firing position.

Marking on high explosive shell

T - kind of filler /RDX/
OF 350 - type and model of shell /HE/
76 - caliber of weapon
H - weight zone marking /normal/

Marking on high explosive anti-tank shell

T/X - kind of filler /TNT and RDX/
BP 350/2 - type and model of shell /HE, AT
76 - caliber of weapon
H - weight zone marking /normal/
60/40 - 60% TNT and 40% RDX